EQUIPMENT REPLACEMENT ANALYSIS FOR PUBLICLY OWNED FLEETS

RICHARD CHARLES EDWARD APPLEBY

EQUIPMENT REPLACEMENT ANALYSIS FOR PUBLICLY OWNED FLEETS

BY

Richard Charles Edward Appleby, B. Eng.

A thesis submitted to the School of Graduate

Studies in partial fulfilment of the

requirements for the degree of

Master of Engineering

Faculty of Engineering and Applied Science
Memorial University of Newfoundland

April 1993

St. John's Newfoundland Canada

ISBN 0-315-86661-6

ABSTRACT

The economic life of equipment is the point in time when the sum of all equipment costs are minimum. The factors associated with equipment costs are operating and maintenance costs, ownership costs, obsolescence costs, parts cost, downtime cost and training costs. With today's economy, public sector agencies are finding it more and more difficult to acquire the funding necessary to operate, maintain and replace their equipment fleets. In many cases, equipment is used far beyond its optimum economic life because of this lack of funding. In these cases, the fleet manager requires some method of prioritizing the equipment replacement list.

In order to effectively plan equipment replacement purchases, the fleet manager must have the ability to forecast future costs. In some cases, geographic location has an impact on delivery time of new equipment to the public agency and forecasting future equipment costs can provide the lead time necessary to order the new equipment before the end of its economic life. In other cases, the timing of budget approval for replacement funding can delay the purchase of new equipment.

The criteria used for deciding when equipment should be replaced vary from one agency to the next. There are also some differences in the criteria used depending on whether the agency is public or privately owned.

There are several fleet replacement techniques available to the fleet owner. In general terms, the life cycle cost method, interval life method and nomographs are commonly used. Each method has varying degrees of complexity. The causes of each

method depends on the accuracy of the input information used by the fleet manager.

Commercially prepared software is available to the fleet manager to assist in the equipment replacement decision. These software packages perform different types of fleet management functions. Fleet managers should thoroughly investigate the software being considered to ensure it fulfils their needs.

Fleet replacement models can be developed in-house or by computer software consultants. The model should be designed so that it is adaptable and easily modified by the fleet owner. It should have the ability to compile cost data in a concise and logical format. It should also have the capability of forecasting future equipment costs and provide the fleet manager with a priority listing of equipment to be replaced.

ACKNOWLEDGEMENTS

I would like to acknowledge the following people who assisted me in the completion of this thesis:

Professor W. J. Campbell, Memorial University of Newfoundland for his guidance throughout my Masters Degree Program.

Appreciation is also given to Professor M. G. Andrews for his advice and assistance during the writing of this thesis.

I would like to thank my wife and family for their encouragement at all times, especially over the last several months.

TABLE OF CONTENTS

2. FLEET REPLACEMENT ANALYSIS TECHNIQUES

3. FORECASTING TECHNIQUES

4. FLEET REPLACEMENT ANALYSIS FOR PUBLICLY OWNED FLEETS (FRAPOF) MODEL

LIST OF FIGURES

LIST OF TABLES

LIST OF SYMBOLS, ABBREVIATIONS AND ACRONYMS

Symbols

C_D - Downtime cost in a given year
D - Downtime percentage of existing machine
H_p - Planned annual usage of existing machine in hours
C_R - Hourly cost in a given year
C_o - Obsolescence cost in a given year
P_L - Production loss of existing machine in present
C_s - Standardized operating and Maintenance Cost
T_s - Standard operating units for equipment type
T_A - Actual operating units for equipment type
C_A - Actual operating and maintenance costs
MAC_R - Mean annual cost
P - Purchase price
S_R - Salvage value at period R
ΣX_t - Sum of periods equipment costs
R - Year of replacement
Y_t - Annual equipment cost at time t
a - Intercept on Y-axis
b - Slope of trend line
X_t - Time, t (in years)
N - Number of years of data
b_1 - Estimated linear effect on Y_t
b_{11} - Estimated curvilinear effect on Y_t
log - Logarithm
M_t - Moving average at time t
M^d_t - Double moving average at time t
S'_t - Single exponential smoothing value
α - Smoothing constant
F_p - Priority factor
C_t - Total cost to date
C_{t+1} - Forecast equipment cost next year
P_r - Purchase price of replacement vehicle
S_{t+1} - Salvage value of equipment next year

Abbreviations

APWA - American Public Works Association
ICMA - International City Management Association
ITC - Investment Tax Credit

Acronyms

FRAPOF - Fleet Replacement Analysis Model for Publicly Owned Fleets
O&M - Operating and Maintenance

Chapter 1

PROBLEM DEFINITION

1.1 INTRODUCTION

The acquisition and maintenance of publicly owned fleets is a major part of any jurisdiction's budget. To ensure the fleet operates in an efficient and cost effective manner, the fleet manager must have the capability to decide when equipment should be replaced using an appropriate equipment replacement model.

Unfortunately, there is no simple formula to determine the optimum replacement or the issues to be considered in setting replacement criteria. The importance of each factor must be determined by the fleet owner.

Fleet managers have the difficult task of planning their equipment replacements over a period of years to fall within their budgeting constraints.[1] Budget requirements for equipment purchase vary greatly from one year to the next, while replacement funds supplied by local governing bodies are only increased a small percentage from year to year. Many times, the "economically optimum" replacement time occurs when insufficient funding is available.

In a government setting it is often necessary to plan equipment replacement purchases as much as a year in advance. Accurate forecasts of equipment future costs are therefore required, if the Fleet Manager is to plan for such replacement purchases. This is especially true in remote areas, including Newfoundland.

1.2 FLEET REPLACEMENT QUESTIONNAIRE

A questionnaire was sent to 22 public agencies in Canada and the U.S.A. to determine: (APPENDIX A)

1. What method of fleet replacement analysis is used by the agency?
2. What, if any, type of software is used?
3. Is the software fulfilling all of the agency's needs?
4. Does the agency receive sufficient replacement funds each year?
5. How does the agency decide the order in which equipment is to be replaced?

Seventeen (78%) of the 22 public agencies polled responded to the questionnaire. Table I show the results of the questionnaire.

1.2.1 Fleet Replacement Criteria Used by Respondent

Four main criteria were used by the respondents. They were:

1. Age
2. Mileage
3. Cost
4. Combination of Age/Mileage/Cost

None of the respondents used age only as their replacement criteria. Two (12%) of the respondents used mileage as their only replacement criteria. Seven (40%) of the respondents use cost as their only replacement criteria. The majority of respondents used a combination of age, mileage and cost as their replacement criteria. Eight (48%) of respondents used some combination of these factors as replacement criteria.

Table I

RESULTS OF FLEET REPLACEMENT SURVEY

RESPONDENT	REPLACEMENT CRITERIA	SOFTWARE USED	PRIORITY LISTING	ENOUGH FUNDS	REMARKS
City of Los Angeles	Age/Cond./Cost	Fleet Command	No	No	Trained personnel required to operate system.
Ontario Provincial Police	Age/Mileage	Designed Mainframe Model	No	No	Cannot be modified by user.
City of Bellview, Wash.	Costs	None	No	Yes	
Gov. of Alberta	Mileage	VIMS	No	Yes	Forecasting based on mileage.
Gov. of Manitoba	Costs	AGECON	No	No	No forecasting.
City of Halifax	Costs	None	No	Yes	Manual system.
City of Moncton	None	None	No	No	
Hamilton-Wentworth Police	Mileage	Fleet Plus	No	No	Forecasting based on mileage.
Etobicoke Hydro	Age/Costs	None	No	No	
City of Fredericton	Age/Mile./Costs	None	No	No	
Province of B.C.	Age/Mileage	None	No	No	
City of Windsor	Costs	None	No	No	Economic worksheet used.
City of St. John's	Costs	AGECON	No	No	True cost adjusted for usage
City of New Orleans	Mileage/Costs	None	No	No	
Province of Ontario	Costs	Mainframe Model	No	No	No forecasting.
City of Calgary	Costs	None	No	No	Manual APWA model used.
City of Rochester	Age/Mile./Costs	None	No	No	

1.2.2 Software Used by Respondents

Eight (48%) of the respondents used some form of computer software/hardware to assist in their equipment replacement analysis. Four of these eight agencies, used micro-computers and related software, while the remaining four agencies had a mainframe program that was specially designed for their particular circumstances.

The following is a description of the software/programs being used by the respondents:

- FLEET COMMAND[2]

  Synopsis: Ten modules for fleet management and support including equipment records, work order processing, mechanic productivity, preventative maintenance scheduling, vendor information, parts inventory, fuel usage and billing. Primarily a mainframe application.

- VEHICLE INVENTORY MANAGEMENT SYSTEM (VIMS)[2]

  Synopsis: VIMS is a custom designed system written in MICROFUCUS HIGH PERFORMANCE COBOL. The system can input age and/or mileage replacement criteria and forecast when vehicles will reach a certain age or mileage. System lists all equipment to be replaced on a certain date.

- AGECON[3]

  Synopsis: This software uses economic models to arrive at the optimal time of replacement. AGECON plots operating and maintenance costs against ownership costs to determine the lowest total cost of a particular equipment item.

- FLEET PLUS[2]

  Synopsis: System records all maintenance costs, parts inventory, fuel costs and provides replacement list based on age/mileage criteria input into computer.

- FLEET MANAGEMENT INFORMATION SYSTEM[2]

  Synopsis: This is a mainframe program that produces thirteen different reports on various vehicle data and operating costs. One report is used solely for

vehicle replacement and projects replacement in order of the date each vehicle is to be replaced. Replacement forecasts are based on mileage.

1.2.3 Problems With Software Being Used by Respondents

The problems associated with these programs can be summarized as follows:

- FLEET COMMAND
  - Mainframe program difficult for user to modify
  - Does not perform equipment cost forecasting
  - Does not provide a replacement priority list
  - Requires trained personnel to operate
- VEHICLE INVENTORY MANAGEMENT SYSTEM
  - Custom designed system
  - Provides replacement list based on the date a certain mileage or age reached
  - Does not provide a priority list
- AGECON (APPENDIX B)
  - Does not provide equipment cost forecasting
  - Does not provide a priority listing
- FLEET PLUS
  - Provides a replacement list based on the date a certain mileage or age is reached
  - Does not provide a priority list
- FLEET MANAGEMENT INFORMATION SYSTEM
  - Mainframe program cannot be modified by user

- Does not forecast equipment costs
- Does not provide a priority list

1.2.4. Funding Required for Fleet Replacement and Setting Fleet Replacement Priority List

Fifteen of the seventeen respondents (80%) indicated that they did not receive sufficient funds to replace all equipment requiring replacement. The question then asked of the respondents, was, "How did they decide the order in which equipment was to be replace?"

In all cases, the answer to this question was subjective and was in the following format:

- Use "worst case scenario", that is, replace the worst or those "most likely" to need extensive work.
- Replace equipment with the highest mileage.
- Replace equipment based on "occupational necessities", that is, certain types of equipment are absolutely necessary while others are not as critical.
- Keep equipment which will "most likely" be the least expensive to operate and maintain.
- Department head sets "priority".
- "Establish" a priority list.
- Need, use, etc. - All tempered by current priorities as determined by government officials (politics).

- Essential equipment replaced first.
- Implications of not replacing equipment are discussed by management/government.

1.2.5 Special Problems of Respondents

The main complaint expressed by the respondents was that they did not receive sufficient funds to replace all vehicles and equipment which required replacement in a given year. To complicate this matter, these respondents had no quantitative method to determine the order in which this equipment was to be replaced.

Another problem identified by the questionnaire, was related to the forecasting of equipment's future years' costs. This was a problem for the respondent, because of the required time to receive the new equipment after tenders for this equipment were called. In one case, the average delivery time for the new equipment was between 6 to 8 months in duration. This time, coupled with the 2 to 4 month delay in getting funds approved to purchase this equipment, meant the respondent had to maintain the old equipment for a period of 8 to 12 months beyond its economic life. If the respondent had been able to forecast the total equipment costs the year prior to its scheduled replacement, the new equipment would have replaced the old equipment at the end of its economic life.

1.3 TYPES OF EQUIPMENT LIFE

The life of equipment can be described in three categories:[4]

1. Service Life
2. Technological Life
3. Economic Life

The service life[4] of a vehicle refers to the amount of time a vehicle is capable of operating and rendering useful service, provided it receives adequate maintenance and if worn out parts are replaced with new parts.

The technological life[5] of a vehicle associates the relative decline in productivity of an older model vehicle, to the increased productivity of a new model vehicle. The design of new equipment is usually modified from on year to the next in an attempt to increase productivity, hence increasing the attractiveness of buying the new equipment. One equipment manufacturer has quantified this increase in productivity for some of its equipment by calculating a productivity index for this equipment. The Caterpillar Tractor Company produces a publication entitled "Perspective"[6] for some of the equipment it produces. In this publication, one can track the productivity of a machine, in some cases, as far back as 1947. The technological life of an item of equipment is therefore the amount of time that passes between changes in its productivity index.

The economic life of a machine refers to the time when the total costs for that machine are a minimum.[7] Components that make up the total cost are: operating and maintenance costs, ownership costs, parts inventory cost, obsolescence cost, training costs and salvage value. These will be fully discussed in a following section.

1.3.1 Fleet Replacement Criteria: Public VS Private Fleets

The criteria used to determine a fleet replacement plan, varies, depending on whether or not the fleet being analyzed is publicly owned or privately owned. Table II shows the primary concerns for fleet managers of both types of fleets. The following is a discussion of these concerns.

Table II

PRIMARY CONCERNS FOR SETTING FLEET REPLACEMENT CRITERIA FOR PUBLIC VS. PRIVATE FLEETS

Publicly Owned Fleet	Privately Owned Fleet
1. Age	1. Depreciation
2. Mileage	2. Price
3. Operating & Maintenance Costs	3. Replacement Timing
4. Politics	4. Mileage
5. OTHER CONSIDERATIONS:	5. Maintenance & Reliability
(i) Safety	6. Vehicle Condition at Resale
	7. Taxes
	8. OTHER CONSIDERATION:
	(i) Safety
	(ii) Image
	(iii) Employee Morale

1.3.2 Publicly Owned Fleet Replacement Criteria

Age

Statistically, it is known that failure of some vehicle components is a function of time.[8] This is of particular significance in rubber and plastic parts. In harsh environments, body components are also affected due to age. In a governmental setting,

if the purchasing cycle is missed in any given year, the agency may be required to spend unnecessary monies in order to keep the vehicle in operating condition until the next cycle occurs.

The age of equipment is expressed in the number of years worked for light duty vehicles such as cars and trucks. For heavy equipment, the age is usually expressed in the number of hours worked by the equipment.

Mileage

Many public agencies use mileage as their governing fleet replacement criteria. This is based on the fact that, historically, higher mileage will result in higher failure rates for a vehicle. Many public agencies used both age and mileage as their main replacement criteria. This was confirmed by the response to the fleet replacement questionnaire.

Operating and Maintenance Expenses

Equipment in the same equipment class or type, will develop a pattern of normal operating expenses. When this pattern is established, individual units in a particular class can be tracked to determine if units follow the normal pattern of costs. When searching for the optimum economic life of equipment, this criteria is perhaps the greatest in importance, provided that the information is recorded in a form which can be used by the fleet manager.

Politics

In most public agency environments, there is likely to be some form of elected body which is responsible to represent the private and corporate citizens from which most

of the revenues needed to operate the agency are derived. Political decisions made by such groups, can have an affect on how equipment replacement decisions are made. These decisions can have the greatest impact on fleet replacement, when monies budgeted for fleet replacement is transferred or re-appropriated for other purposes in the public agency. The fleet manager will then require some method of reassessing the equipment requiring replacement and at the same time be able to inform the elected body of the repercussions of their decisions.

Other Considerations

(i) Safety

In recent years, safety is gaining considerable attention in both public and private agencies. Certain equipment will require replacement based on the fact that serious injury to personnel or damage to property may result due to the condition of that equipment. The costs associated with these injuries or damages, can be greater than the cost of replacing the defective equipment. These costs could be in the form of Workman's Compensation payments, fines levied from the local Occupational Health and Safety Department or legal claims as a result of injury or property damages.

1.3.3 Privately Owned Fleet Replacement Criteria

Depreciation

The difference between the purchase price and the resale value of a vehicle is defined as depreciation.[8] In privately owned fleets, depreciation usually has the greatest financial impact on the replacement decision. The loss in value of a vehicle,

often has a greater impact on fleet costs than does maintenance costs. Knowledgeable fleet managers place great emphasis on the impact of depreciation when determining which vehicles should be replaced.

Price

By acquiring equipment at the lowest possible price, without compromising quality, the fleet manager can reduce the difference between the purchase price and the resale value of the equipment. Private fleet owners can usually negotiate the price of this equipment on a one-on-one basis with the equipment dealer. With publicly owned fleets, the acquisition of equipment is normally done through a tender call, where the acquisition price may not necessarily be the lowest price. In Newfoundland, the provincial preference policy has been a factor in this regard.

Replacement Timing

During certain times of the year, the resale value of equipment will be greater than at other times. Generally, the highest resale value will be achieved during the first few weeks of the new model year; September to mid-November. Resale values drop substantially during the winter months due to decreasing consumer demand. Private fleet managers watch the resale market very closely so that they can get the greatest resale value of their old equipment and at the same time minimize the depreciation on newly acquired equipment.

Mileage

This factor has been discussed under Section 1.3.2.

Maintenance and Reliability

Maintenance and operating costs for private fleets will be the same as those in the publicly owned fleet provided the labour costs for mechanical repair personnel are similar. The reliability of the private fleet can have a detrimental effect on the private fleet organizational profits. If a private firm bids a certain project assuming the use of a certain vehicle, and that vehicle should break down during the execution of the project, a replacement vehicle will either have to be purchased or rented. This extra cost will decrease the overall profit of the private fleet owner.

Vehicle Condition

At resale, vehicles which have received good care earn the highest value. If operators are made accountable for the condition of their vehicles, the private fleet owner can expect to achieve the highest resale value for its equipment.

Taxes

From time to time, Canadian and U.S. governments enact Investment Tax Credit (ITC) laws which encourage the purchase of new equipment. The impact of such laws change with the length of time the equipment is kept in service. Also, some governments tax personal property including vehicles. In most cases, the tax declines as a vehicle ages.

Other Considerations

(i) Safety

This has been discussed in Section 1.3.2.

(ii) Image

Vehicle age or condition may have a substantial effect on the image of a private company. When important clients are transported in company vehicles, the image of that company will be enhanced by the good condition of its vehicles. Likewise, equipment in good condition being used on projects, will give clients the confidence to continue dealing with such companies on future projects where this equipment is required.

(iii) Employee Morale

High employee morale will undoubtedly create increased productivity. Employees working with equipment which has low downtime, will likely be less frustrated with trying to complete their assigned jobs. They will also become more interested in keeping the equipment properly maintained.

1.4 SOFTWARE

1.4.1 Commercially Available Software

A market search, of commercially available fleet management software packages, was performed. Table 3 shows a total of 40 software packages are available for various fleet management functions. Nine (23%) of these software packages have some fleet replacement analysis capabilities. Three of these nine packages, use age/mileage as replacement criterion. The remaining six packages, use equipment costs as replacement criterion.

Table III

COMMERCIALLY AVAILABLE COMPUTER SOFTWARE

SOFTWARE	PROVIDES COST TRACKING	REPLACEMENT CRITERIA USED	PROVIDES FORECASTING	PROVIDES PRIORITY LIST	USER CAN MODIFY SOFTWARE	REMARKS
Mesis	Yes	N/A	No	No	No	Designed for each user
EX-Fleet	Yes	N/A	No	No	No	Special data collection equip.
Vehicle Control Plus	Yes	N/A	No	No	No	Repair tracking system
BTMI/EMS	Yes	Age/Mileage	Yes	Yes	No	No longer sold
Equipment Management	Yes	N/A	No	No	No	Data base manager
Fleet Manager	Yes	Costs	No	No	No	
Tremain	Yes	N/A	No	No	No	Equipment inventory system
CFA-VHRS	Yes	N/A	No	No	No	Repair tracking system
MCMS	Yes	N/A	No	No	No	Mainframe application
TIMS	Yes	N/A	Yes	No	No	Repair tracking system
VMS	Yes	Usage/Costs	No	No	No	
GEMS	Yes	Age/Mileage	No	No	No	Forecasts by Age/Mileage
Vehicle Ctrl VMRS	Yes	N/A	No	No	No	Designed for truck fleets
Equipment Maintenance Management System	Yes	N/A	No	No	No	Repair tracking system
Vehicle Cost Analyzer	Yes	Costs	No	No	No	Individual analysis
Fleet Controller	Yes	N/A	No	No	No	Data base manager
Fleet Cost Control	Yes	N/A	No	No	No	Repair tracking system
Fleet Tracker	Yes	N/A	No	No	No	Repair tracking system
Mainsaver	Yes	N/A	No	No	No	Repair tracking system
Maintenance Management System	Yes	N/A	No	No	No	Repair tracking system
Fleet Maintenance Module	Yes	N/A	No	No	No	Repair tracking system
CHRIS	Yes	N/A	No	No	No	Repair tracking system
Fleet Command	Yes	N/A	No	No	No	Mainframe application
Fleet*Mate	Yes	N/A	No	No	No	Repair tracking system
VEMS	Yes	N/A	No	No	No	Data base manager
Penton Maintenance	Yes	N/A	No	No	No	Repair tracking system
EMS/PC	Yes	N/A	No	No	No	Repair tracking system
Lanta Parts Inventory	No	N/A	No	No	No	Parts inventory only
Utilifleet	Yes	N/A	No	No	No	Data base manager
Fleet Maintenance System	Yes	N/A	No	No	No	Data base manager
Taskforce	Yes	N/A	P.M. Only	No	No	Repair tracking system
Vehicle CTRL	Yes	Costs	No	No	No	Repair tracking system
Dataforce	Yes	Costs	No	No	No	
Parts Force	No	N/A	No	No	No	Parts inventory only
MMS-II	Yes	N/A	No	No	No	Repair tracking system
Maintenance Management	Yes	N/A	No	No	No	Repair tracking system
FMS: Fleet Management Program	Yes	N/A	No	No	No	Repair tracking system
FLMS	Yes	N/A	No	No	No	Repair tracking system
AGECON	Yes	Costs	No	No	No	
Fleet Plus	Yes	Age/Mileage	Yes	No	No	

Three software packages (7%) do perform forecasting functions, and is done on the basis of determining when a vehicle will reach a certain age or mileage.

One of the software packages (3%) has the capability of providing a listing of vehicles which require replacement. Vehicles are selected for replacement if they meet the software replacement criteria. In this particular case, vehicles which have reached a certain age/mileage are selected for replacement.

It has been found that most computerized fleet management packages are not appropriate for municipal applications.[9] Despite the variety of programs and systems available, many facts and fantasies arise after these systems are implemented.[10]

None of the software packages listed in Table III can be modified by the user. The only flexibility the user has with some of these packages is in the input of replacement criteria. Some of these programs will give the user a choice of replacement criteria permitted to be used with the system.

Appendix B gives a detailed listing of software packages shown in Table 3 which provides; vendor information, hardware requirements, and a synopsis of each software package.

1.5 PURPOSE OF THE RESEARCH

The purpose of the research is as follows:

To develop an equipment replacement model for publicly owned fleets which will incorporate the following capabilities:

(a) Forecast future equipment costs.

(b) The model will provide the fleet owner with the optimum equipment replacement time.

(c) The model will provide the fleet owner with a priority listing giving the order in which the equipment is to be replaced.

(d) The model will be user friendly and not require computer programming by the fleet owner.

(e) The model will be flexible so that it can be modified by the owner as required.

1.6 METHODOLOGY

The research presented in this thesis was developed based on the following methodology:

1. Publicly owned agencies were polled to determine how equipment replacement analysis was performed on their fleet.
2. A literature review, in the area of fleet management, was performed to identify sources of information in this area. The types of equipment life and the criteria used for both public and private fleets were researched.
3. Available software packages in this field were researched and analyzed.
4. The various costs associated with total equipment costs as discussed.
5. All types of equipment replacement analysis techniques are reviewed.
6. Forecasting techniques for equipment costs in a time series are analyzed.

7. A method of equipment replacement analysis is recommended which incorporates equipment costs, forecasting and a priority listing of equipment to be replaced.

8. The recommended fleet replacement analysis model is implemented with an existing publicly owned fleet.

Chapter 2

FLEET REPLACEMENT ANALYSIS TECHNIQUES

2.1 INTRODUCTION

There are several fleet replacement analysis techniques available to the fleet manager. The complexity of these techniques is varied. Therefore, the type of fleet replacement analysis technique chosen, should fit the operational needs of the fleet owner.

In most cases, the fleet replacement process will exhibit several common traits. These characteristics can be summarized by Figure 2.1. This figure shows a typical fleet replacement process.

With the fleet replacement process in place, the fleet manager requires cost data on the equipment being analyzed. Several cost factors should be considered in the total equipment costs. These costs can be summarized as follows:

1. Ownership Costs
2. Operating and Maintenance Costs
3. Downtime Costs
4. Parts Inventory Costs
5. Training Costs
6. Obsolescence Costs

These cost factors, as well as the various types of equipment replacement analysis techniques will be discussed in this section.

THE FLEET REPLACEMENT PROCESS

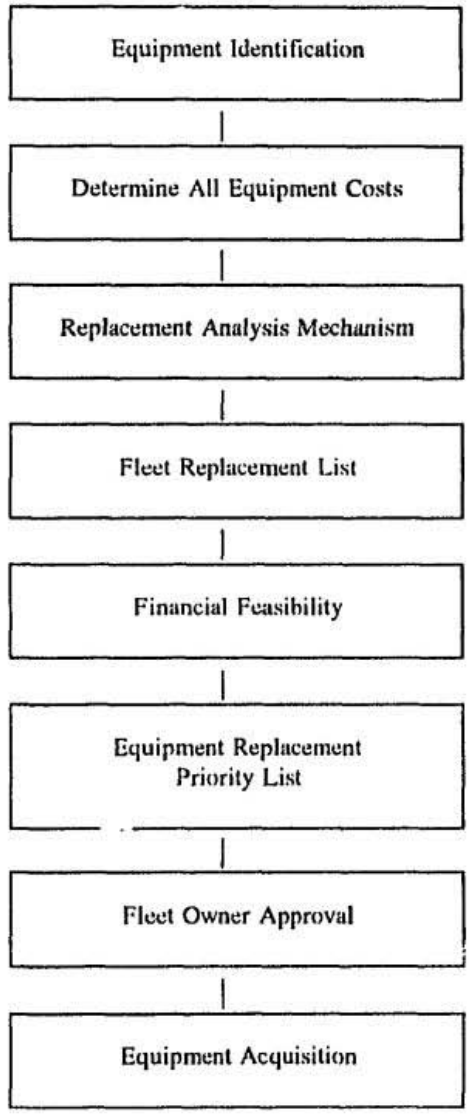


Figure 2.1

2.2 EQUIPMENT COSTS

2.2.1 Ownership Costs

Annual equipment ownership costs, as the name implies, refers to the annual costs incurred by an agency to own equipment.[11] Several factors can be considered in the determination of these costs as follows:

1. Depreciation
2. Investment Cost, Taxes, Insurance, Storage and Miscellaneous

The following sections shall briefly discuss each of these factors.

2.2.1.1 Depreciation

Depreciation is defined as the annual decrease in equipment value through wear, deterioration or obsolescence. The profitable fleet owner must recover the loss in value of equipment during its useful life.

The general term depreciation should not be confused with the specific term depreciation accounting.[12] Depreciation accounting is the systematic allocation of the costs of a capital investment over a specific number of years. There are three reasons for calculating the depreciation accounting value of equipment. They are:

1. To provide the owner with an easily calculated estimate of the current market value of the equipment.

2. To provide a systematic method for allocating the depreciation portion of equipment ownership costs over a specific time period.
3. To allocate the depreciation portion of ownership costs in such a manner to accrue the greatest tax benefits.

To determine the depreciation of any type of equipment, the following information is required:

1. The original purchase price of the equipment.
2. The approximate economic life of the equipment. (Term)
3. The estimated resale value of the equipment. (Salvage)

With this information, depreciation can be calculated using several methods. Three of the most common methods are:[12]

1. Straight Line Method
2. Sum of Year Digits Method
3. Declining Balance Method

A description of these methods is available in any economics reference book.

2.2.1.2 Investment Cost, Taxes, Insurance, Storage and Miscellaneous

Investment costs are costs associated with interest payments on money borrowed to purchase new equipment. Many owners charge interest as part of hourly ownership and operating costs while others consider it as general overhead in the overall operation.[13] Interest is usually based on the owners average annual investment in the

unit and it should be considered whether or not the machine is purchased outright or financed.

All taxes and insurance which are assessed against each machine should be included in ownership costs. The Canadian and U.S. Governments sometimes enact tax laws which can have positive or negative effects on ownership costs. In some cases, tax credits are provided to encourage equipment purchases. In other cases, taxes are levied against vehicles based on the vehicles value at any given time. In the United States, some states tax personal property, including vehicles. In most situations, the tax declines as a vehicle ages.

Other factors which could be associated with ownership costs, would be storage fees such as rent or maintenance costs of equipment storage yards and buildings. Miscellaneous ownership costs[14] such as wages for security guards, for protection of the equipment fleet, expenses for handling equipment in and out of storage may also be considered as ownership costs. An example of this cost could be float charges for dozers and track excavators.

2.2.2 Operating and Maintenance Costs

The most significant factor affecting the total equipment cost is the operating and maintenance (O&M) costs. The operating costs would include all costs associated with the equipment's operation such as fuel, oil, fluids, and all other items required for the efficient operation of a particular equipment item.

The maintenance costs would include all costs associated with the repair of the equipment item for both preventative and demand maintenance. These costs would include all labour, parts, and equipment costs required for such maintenance. Preventative maintenance would involve scheduled service checks on the equipment which, in theory, should reduce some of the demand maintenance requirements. Demand maintenance would involve the repair of equipment due to damage to or the malfunction of the equipment item.

2.2.3 Downtime Cost Factor

Consideration in the determination of this cost factor are the internal and external equipment rental rates, operators wages, overtime rates, and any costs incurred due to the delay of work.

Annual downtime hours can be obtained from the fleet cost tracking mechanism being used by the agency.

The internal and external rates of all equipment must be known. If an agency has to rent "outside" equipment to replace one of its equipment items, this is an extra cost which must be borne by the agency.

The wages paid to the operator, of a machine that is down for repairs, must also be considered in the total downtime cost of the machine. For some public agencies, this cost will vary depending on how it can deal with the idle operator. Where collective agreements are in place, there may be restrictions placed on how the operator can be used once the machine he/she is assigned to is down for repairs. If the operator is not

permitted to operate another type of equipment, or does not possess the knowledge and experience to operate another type of equipment, the wages of that operator will be another cost consideration in the downtime cost factor.

One method of determining downtime cost is by using the following formula:

$$C_D = D \times H_P \times C_R \qquad \text{Equation 2-1}$$

Where

C_D = Downtime cost in a given year

D = Downtime percentage of existing machine

H_P = Planned annual usage of existing machine in hours

C_R = Hourly cost of replacement machine

2.2.4 Parts Inventory Cost

Another cost that must be considered in the total equipment cost, is the cost of parts inventory and the carrying costs associated with stocking those parts.

The cost of parts inventory can be obtained from the agencies inventory records. Ideally, parts should be categorized by equipment make. The cost of the same type of parts items, may be different for machines in the same class of equipment, due to differences in design of each particular make of machine.

The carrying charges incurred by the agency are also an important consideration in the determination of the parts inventory cost. The method which this cost could be determined, would be to apply the appropriate inflation factor as a function of time, to the particular parts item.

2.2.5 Training Costs

The cost to train operators in the safe operation of the various equipment types is also an important cost consideration in the total equipment cost. This cost will vary depending on the type of equipment involved.

Training can be done either in-house or provided by professional equipment operator training schools. For large agencies, the in-house approach may be the best alternative for the training for personnel. Using this method the operator could be trained on the equipment item he/she may be required to operate once the training is completed.

For smaller agencies, the professional equipment operator training school may best suit their needs. These agencies will have less equipment to call on for in-house training and will not have a great need to employ its own equipment operator training personnel.

2.2.6 Obsolescence Cost

As an equipment item ages, there may be a cost associated with the obsolescence of that particular type of machine.

As advances are made in the technology of certain equipment items design, older machines become less efficient than similar new machines. An additional cost is incurred on the agency due to a decrease in the efficiency of the older equipment item. The older machine may have to work longer to produce the same result of that of a new similar machine.

Improvements in the quality of equipment components, such as stronger materials and the accessibility of replacement parts will also have an affect on the obsolescence cost of a particular equipment item.

Provided the appropriate information is available, the obsolescence cost can be calculated from the following formula:

$$C_O = P_L \times H_P \times C_R \qquad \text{Equation 2-2}$$

Where

C_O = Obsolescence cost in a given year

P_L = Production loss of existing machine in percent

H_P = Planned annual usage of existing machine in hours

C_R = Hourly cost of the replacement machine

2.2.7 Standardized Usage

When comparing the total equipment costs for the various equipment types, consideration must be given to the amount of usage each item of equipment receives. To illustrate this, two similar equipment items are compared. An older machine may have less total operating and maintenance costs than a new machine. If an equipment replacement analysis is done based only on these costs, the new machine would be scheduled for replacement before the older machine. If, however, the usage of each machine is incorporated into these costs, the results would be the opposite. This can be represented by the following expression:

$$C_S = \frac{T_S}{T_A} \times C_A \qquad \text{Equation 2-3}$$

Where

C_S = Standardized Operating and Maintenance Costs

T_S = Standard Operating Units for Equipment Type

T_A = Actual Operating Units for Equipment Type

C_A = Actual Operating and Maintenance Costs for Equipment Type

Figure 2.2 shows how usage of equipment can affect equipment costs. It also shows how these costs can be standardized for the purposes of equipment replacement analysis.

COST COMPARISON OF EQUIPMENT BASED ON DIFFERENT USAGE

Standardized Annual Usage (hours): 1800 hours per year

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Total
Annual Equip. Cost, C_A - Machine "A"	33,165	12,507	27,402	34,501	40,836	37,724	186,135
Annual Equip. Cost, C_A - Machine "B"	21,079	40,021	46,905	59,531	**40,035**	39,092	246,663
Annual Equip. Usage (hrs), T_A - Machine "A"	1,750	920	1,200	1,400	1,530	1,500	8,300
Annual Equip. Usage (hrs), T_A - Machine "B"	1,660	2,200	1,900	1,950	**1,600**	1,920	11,230
Standarized Equip. Cost, C_s - Machine "A"	34,113	24,470	41,103	44,358	48,042	45,269	237,355
Standarized Equip. Cost, C_s - Machine "B"	22,857	32,744	44,436	54,952	**45,039**	36,649	236,677

Example $C_s = \frac{1,800}{1,600} \times \$40,035 = \$45,039$

Figure 2.2

2.3 ANALYSIS TECHNIQUES

Three types of equipment replacement analysis techniques will be discussed in this section. They are:

1. Life Cycle Cost Method
2. Interval Life Method
3. Nomographs

2.3.1 Life Cycle Cost Method

The life cycle cost method of equipment replacement analysis refers to the analysis of the various equipment cost factors previously discussed in Section 2.2. Figure 2.3 shows a typical life cycle cost method for equipment replacement analysis.

TYPICAL LIFE CYCLE COST METHOD

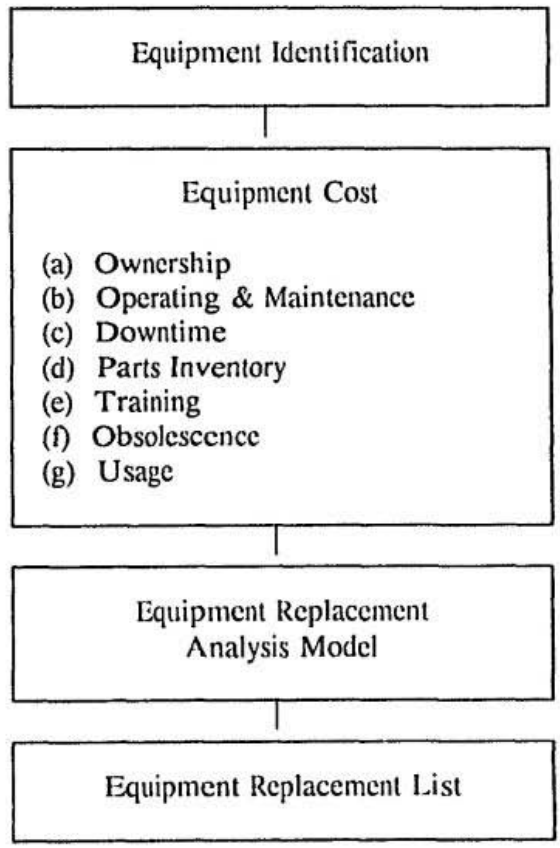


Figure 2.3

This method calculates the total annual equipment costs. These costs are then plotted against time. The optimum time to replace the equipment being analyzed, would be when these costs are a minimum. Figure 2.4 shows the typical relationship between these costs.

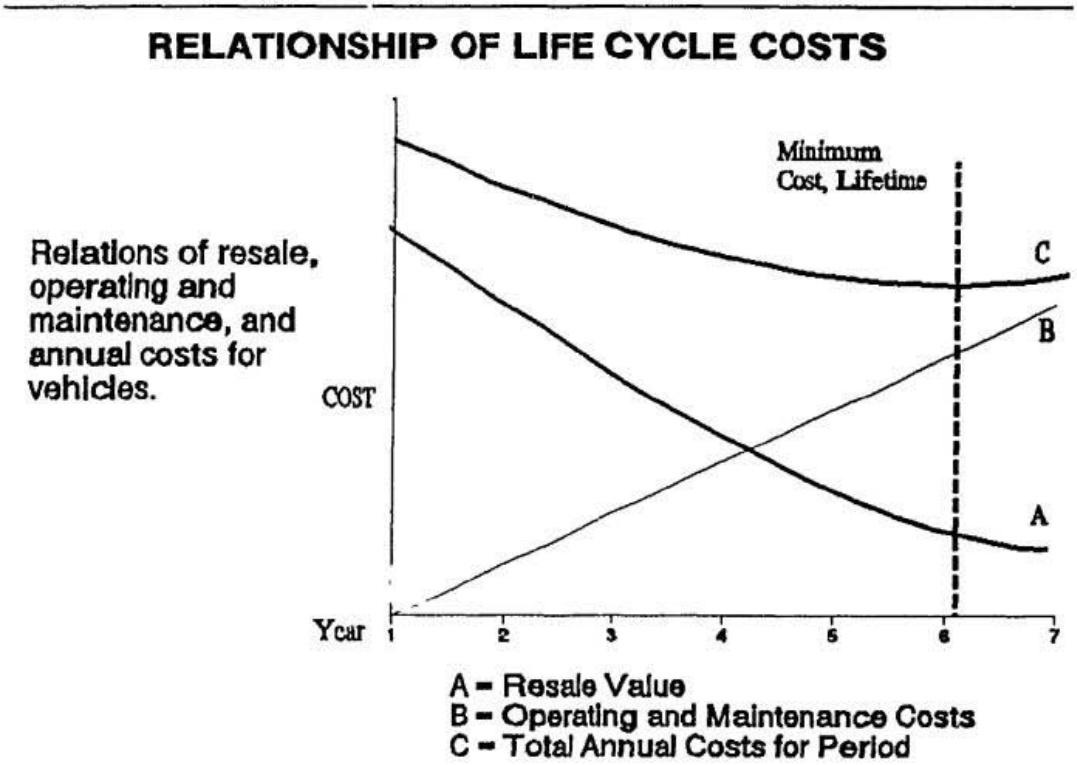


Figure 2.4

A slight variation to this method is with the use of "average" annual equipment costs.[4] In this method, the optimum replacement time is when average annual equipment costs are a minimum. Figure 2.5 illustrates the relationship of these costs.

The average annual costs[4] can be calculated from the following formula:

$$MAC_R = \frac{P - S_R + \sum_{t=1}^{R} X_t}{R} \qquad \text{Equation 2-4}$$

Where

MAC_R = Mean Annual Cost at Period R

P = Purchase Price at Time T=0

S_R = Salvage Value at Period R

ΣX_t = Sum of Periods Equipment Costs

R = Year of Replacement

The time value of money must be included in all equipment cost factor amounts.

Appendix C shows a typical example of equipment replacement analysis using average annual equipment costs.

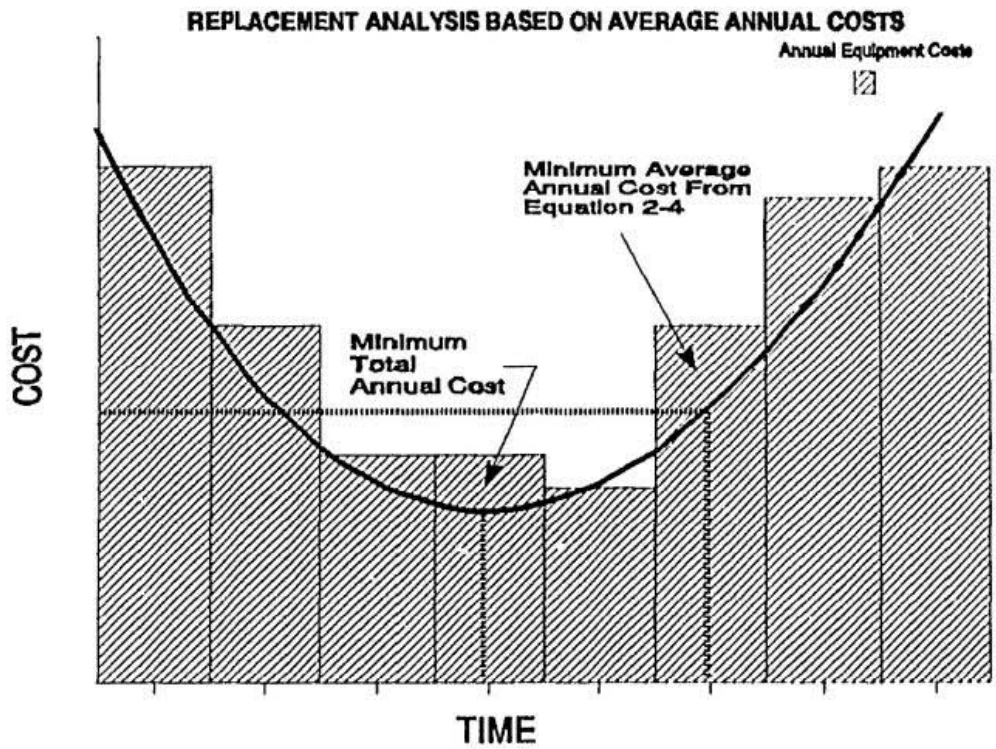


Figure 2.5

2.3.2 Interval Life Method

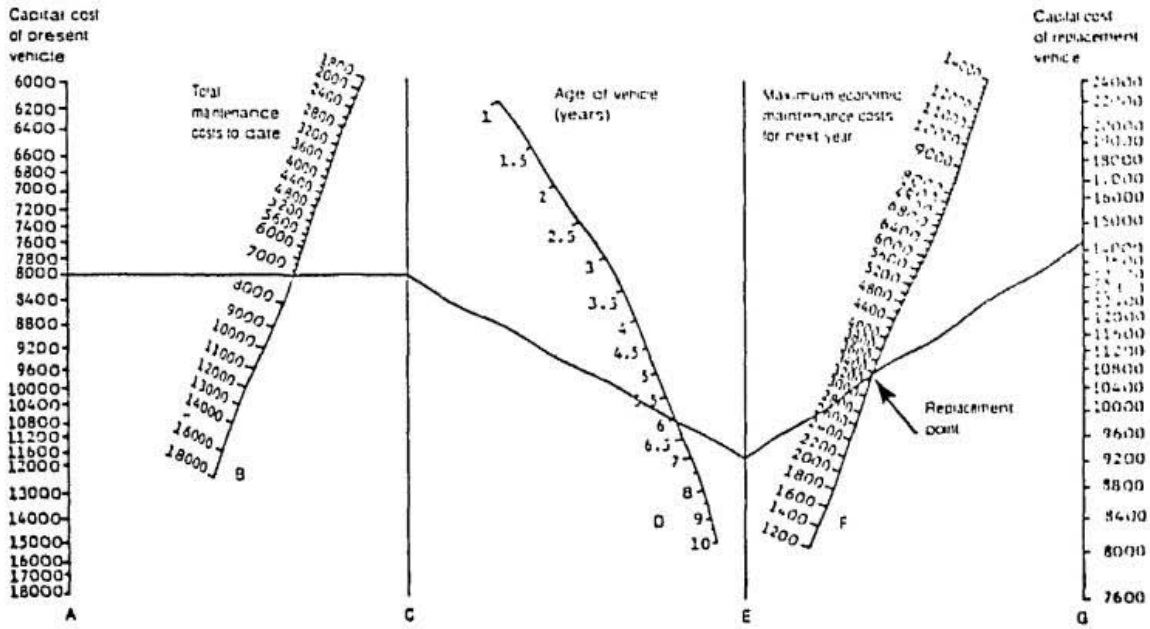
This method is used where the fleet owner uses age and/or mileage as fleet replacement criteria. In this method the fleet owner replaces equipment that has reached its replacement age or mileage criteria. This method is very simple and requires little analysis. The data required for this method of analysis would be the age and/or mileage of the equipment. If the owner's mileage replacement criteria was 100,000 km, all vehicles with oedometer readings greater than 100,000 km would be replaced. Similarly, if the age replacement criteria was five years for a certain type of equipment, all vehicles older than five years of age would be replaced.

2.3.3 Nomographs

Commercially prepared nomographs[14] are available for equipment replacement analysis. They are a graphical representation of the life cycle costing method previously discussed. They are inexpensive, straightforward and easy to use. These nomographs can be used without any special mathematical or statistical skills. The information required to use these nomographs are:

1. Purchase price of the equipment
2. Total maintenance cost to date
3. The age of the equipment
4. The purchase price of a new machine

NOMOGRAM FOR VEHICLE REPLACEMENT



Initial cost: $8,000. Total maintenance cost to date: $7,200. Age: 6 Years. Replacement Cost: $14,000. Replace the vehicle when the maintenance cost for the next year is projected at $3,300 or greater.[14]

Figure 2.6

The projected cost of repairs for the next year will determine whether equipment replacement is necessary. Figure 2.6 shows a typical nomograph used for equipment replacement analysis. This nomograph calculates the maximum permissible "economic" maintenance costs for the next year. If the actual maintenance costs in the next year exceeds this amount, the equipment should be replaced.

2.4 ECONOMIC LIFE OF EQUIPMENT USING PERFORMANCE FACTORS

Equipment owners should be interested in obtaining the lowest possible cost per unit of production.[12] In order to determine the most economical time to replace equipment, accurate records of the various equipment costs associated with each machine must be kept. Similarly, accurate records of the equipment performance indicators must be maintained.

Typical performance indicators can be hours of use or, volume of material excavated. The fleet owner can then calculate a yearly production cost per machine in terms of cost per hour of usage or cost per volume of material excavated.

The fleet owner would consider replacing a machine, when the annual production cost of the machine begins to increase. This method of analysis could be incorporated into the life cycle cost method of equipment replacement analysis discussed in Section 2.3.1.

Chapter 3

FORECASTING TECHNIQUES

3.1 INTRODUCTION

Decisions in the private and public sector[15] depend on the perceptions of future outcomes that will affect the benefits and costs of possible alternative courses of action. Since these alternatives take place in the future, they must be forecast.

Accurate forecasts of future equipment costs will help the fleet owner make the equipment replacement decision prior to the end of the equipment's economic life. This will enable the fleet owner to avoid spending excessive amounts of monies on certain types of repairs, and also provide the lead time required in some areas, to order the new replacement vehicle.

An extremely useful form of forecasting procedure is time series analysis. A time series is a set of statistical observations arranged in chronological order. In the case of fleet replacement analysis, these observations would be the annual total costs for a piece of equipment.

The prediction of any time series in fleet replacement analysis involves the examination of past equipment costs. Methods of time series analysis are descriptive in nature and do not provide for probability statements concerning future events. It is important to note that these methods must be always supplemented by sound subjective judgement. Figure 3.1 shows a typical forecasting process.[16]

THE FORECASTING PROCESS

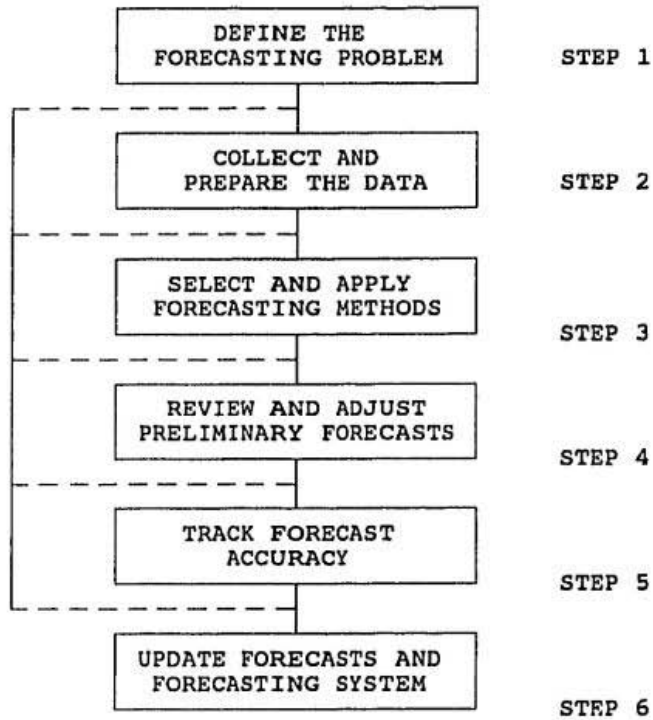


Figure 3.1

3.2 METHODS OF FORECASTING FUTURE YEARS' COSTS

The following types of forecasting methods shall be investigated:

1. The Method of Least Squares
2. Second Degree Polynomial Function
3. Logarithmic Trend Line
4. Moving Average Method

5. Exponential Smoothing
6. Box-Jenkins Method

3.2.1 Method of Least Squares

The method of least squares is used to fit trend lines because of its simplicity. It should be recognized that while using this method for times series analysis, the usual probabilistic assumptions made in regression analysis are not met. This is because in time series analysis, time is the independent variable, "X" and equipment costs the dependent variable "Y". It is not reasonable to think of the deviation of actual equipment costs in a given year from the computed trend value as a random error. Also, the assumption of independence in regression analysis is not met in the case of time series analysis. Equipment costs in a given year surely are not independent of what they were in the preceding year.

The method of least squares produces a straight line in the form of the following equation:

$$Y_t = a + bX_t \qquad \text{Equation 3-1}$$

Where

Y_t = Equipment Cost at Time T

a = Intercept on Y-axis

b = Slope of the Trend Line

X_t = Time, t (in years)

The slope, b, of the trend line is calculated from the following formula:

$$b = \frac{\sum_{t=1}^{n} X_t Y_t - \frac{(\sum_{t=1}^{n} X_t)(\sum_{t=1}^{n} Y_t)}{n}}{\sum_{t=1}^{n} X_t^2 - \frac{(\sum_{t=1}^{n} X_t)^2}{N}}$$ Equation 3-2

Where

n = Number of Years of Data

The intercept of the trend line is calculated from:

$$a = \bar{y} - b\,\bar{x}$$ Equation 3-3

Where

$\bar{y}$ = Mean of All Equipment Cost Data

$\bar{x}$ = Mean of the x_t Values

3.2.2 Forecasting a Second Degree Polynomial Function with the Method of Least Squares

The second degree polynomial trend line can be fitted[17] in the form of the following equation:

$$Y_t = a \quad b_l X_t + B_{ll} X_t^2$$ Equation 3-4

Where

a = Y-axis Intercept

b_l = Estimated Linear Effect on Y_t

B_{ll} = Estimated Curvilinear Effect on Y_t

The trend equation co-efficients are determined by solving the following three equations simultaneously:

$$\text{I.}\quad \sum_{t=1}^{n} Y_t = na + b_I \sum_{t=1}^{n} X_t + b_{II} \sum_{t=1}^{n} X^2_t \qquad \text{Equation 3-5}$$

$$\text{II.}\quad \sum_{t=1}^{n} X_t Y_t = a\sum_{t=1}^{n} X_t + b_I \sum_{t=1}^{n} X^2_t + b_{II} \sum_{t=1}^{n} X^3_t \qquad \text{Equation 3-6}$$

$$\text{III.}\quad \sum_{t=1}^{n} X^2_t Y_t = a\sum_{t=1}^{n} X^2_t + b_I \sum_{t=1}^{n} X^3_t + b_{II} \sum_{t=1}^{n} X^4_t \qquad \text{Equation 3-7}$$

3.2.3 Forecasting Using a Logarithmic Trend Line

The equation of the logarithmic line that would describe the trend of a time series is as follows:

$$\text{Log } Y_t = a + bx \qquad \text{Equation 3-8}$$

The constant, A, and slope, B, of this equation are computed as follows:

$$a = \frac{\sum_{t=1}^{n} \log Y_t}{n} \qquad \text{Equation 3-9}$$

and

$$b = \frac{\sum_{t=1}^{n} X_t \log Y_t}{\sum_{t=1}^{n} X^2_t} \qquad \text{Equation 3-10}$$

After "a" and "b" are calculated, Y_T can be calculated by substituting values of X (time) into the trend equation.

Logarithmic second-degree curves can also be fitted to time series in which the trend is increasing at an increasing or decreasing percentage rate. For polynomials greater than the third degree, this method of forecasting is not recommended as curves computed by such polynomials permit many changes in direction. These curves do not have the smooth, continuous movement characteristic of a time series.

3.2.4 Moving Average Method of Forecasting

The moving average method of forecasting is one of the simplest time series to use.[18] This technique assumes that the pattern exhibited by the historical data can be represented by the arithmetic means of past data. The simplest moving average model is in the following form:

$$M_t = Y_{t+1} = \frac{Y_t + Y_{t-1} Y_{t-2} \ldots . Y_{t-n+1}}{N} \qquad \text{Equation 3-11}$$

Where

M_t = Moving Average at Time T

Y_t = Actual Value of the Data at Time T

N = Number of periods included in the Moving Average

Y_{t+1} = Estimate Value of Data at Time, T+1

Equipment cost data usually exhibits some form of increasing trend as a function of time. The simple moving average method described above may be inappropriate in these cases. If a trend is present in the cost data, the simple moving average values will lag behind the actual data. To correct for this problem, a double moving average M_T

should be calculated. To calculate M_T, each value of M_T is treated as one data point and a second moving average is calculated based on M_T observations. This can be expressed by the following formula:

$$M^d_t = \frac{M_t + M_{t-2} + \ldots . M_{t-n+1}}{n} \qquad \text{Equation 3-12}$$

The double moving aver: ge forecast is based on the following formula:

$$\hat{M}^d_{t+T} = a_t + b_tT \qquad \text{Equation 3-13}$$

$\hat{}$ denotes forecast value

The constant, "a_t", and slope, "b", of the formula can be calculated as follows:

$$a_t = 2M_t - M^d_t \qquad \text{Equation 3-14}$$

and

$$b = \frac{2}{n-1}(M_t - M^d_t) \qquad \text{Equation 3-15}$$

In using equation 3-13 to develop the next year's equipment cost, t has a value of 1.

As each new data observation becomes available, new values for "a_t" and "b" in equations 3-14 and 3-15 respectively, can be calculated. A new next year forecast can then be determined.

3.2.5 Exponential Smoothing

Exponential smoothing is a widely used time-series forecasting model. New forecasts are derived by adjusting the prior forecast to reflect its forecast error. In this way, the forecasts are continually being revised based on past experience.

Exponential smoothing offers several advantages over other forecasting techniques as follows:

1. Exponential smoothing models mesh very easily with computer systems.
2. Data storage requirements are minimal compared to other forecasting techniques.
3. Exponential smoothing models react more quickly to changes in economic conditions than do moving average models.

In single exponential smoothing, the forecast for the next year and all subsequent years, is determined by adjusting the current year forecast by a portion of the difference between the forecast and actual value.

The basic formula for single exponential smoothing is as follows:

$$S^i_t = \alpha Y_t + (1 - \alpha) S^i_{t-1} \qquad \text{Equation 3-16}$$

Where

S^i_t = Single Exponential Smoothing Value

Y_t = Actual Value in Time Period t

α = the Smoothing Constant ($0 \leq \alpha \leq 1$)

It can be shown that α is related approximately to the number of periods in a simple moving average by the following formula:

$$\alpha = \frac{2}{n + 1} \qquad \text{Equation 3-17}$$

Another method of selecting an appropriate value for α is by investigating a graph of the data over time. If the plot shows little variation in the data, a small value

of α should be chosen. If the plot shows great variations in the data, a corresponding greater value of α should be selected by the user.

Other methods of exponential smoothing which can be used are: (APPENDIX D)

1. Double Exponential Smoothing
2. Winter's Method (Seasonal)
3. Brown's Linear Exponential Smoothing
4. Triple Exponential Smoothing
5. Adaptive - Response - Rate Exponential Smoothing
6. Holts Exponential Smoothing

3.2.6 Box-Jenkins Forecasting Method

The Box-Jenkins Method of forecasting is a self-projecting time series model. This method of forecasting is based on statistical concepts and principles. The Box-Jenkins method of forecasting can be used if the following requirements are met:

1. Data representing the historical behaviour of what you want to forecast is available.
2. This data is sufficient in quantity to establish a track record.
3. The forecasting required is short to medium term.

The computations involved in the Box-Jenkins method are much too labourious and time consuming to perform by hand. A computer is an absolute must if the user is to successfully utilize this forecasting method.

Many commercially available Box-Jenkins programs are available through commercial software distributions. Appendix E gives a listing and synopsis of those software packages available.

Chapter 4

FLEET REPLACEMENT MODEL FOR PUBLICLY OWNED FLEETS

4.1 MODEL STRATEGY

The development of a fleet replacement analysis model for publicly owned fleets (FRAPOF MODEL), requires the determination of a model strategy. The strategy being proposed in this model is as follows:

1. The model must be adaptable and easily modified to meet the users specific needs.
2. It must have the ability to compile equipment data in a concise and logical manner.
3. It must have the ability to forecast future costs.
4. It must provide the user with an equipment replacement priority list.

The model will consist of five modules as shown in Figure 4.1.

4.1.1 Adapting and Modifying the Model

The FRAPOF Model developed will be adaptable to most spreadsheet computer software packages. The intent of the model, is to provide the user with a spreadsheet which will perform several mathematic functions using spreadsheet packages such as Lotus 1-2-3.[19]

Using the existing software packages will serve two purposes:

THE FLEET REPLACEMENT MODEL (FRAPOF)

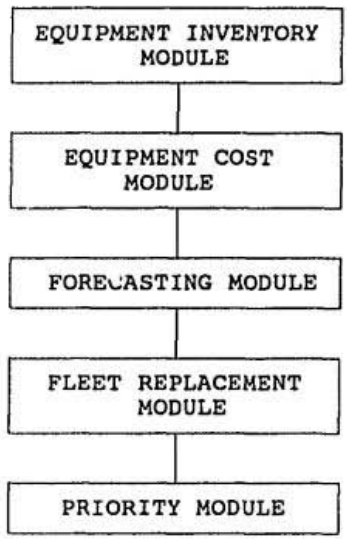


Figure 4.1

1. Eliminate the need for complex computer programming by the user.
2. The model can be adapted and modified by users who are comfortable working with their chosen spreadsheet software packages.

4.1.2 Compiling Equipment Data

The FRAPOF Model developed, will compile various types of information about the equipment being analyzed. This information will include the following parameters:

1. Equipment Identification
   (a) Unit Number
   (b) Equipment Class
   (c) Model Year

2. Equipment Costs

4.1.3 Forecasting Future Equipment Costs

The FRAPOF Model can perform time series forecasting by any of the techniques described in this thesis. The model will calculate the equipment costs for one year into the future. The method of forecasting chosen will be at the discretion of the user.

4.1.4 Replacement Priority List

The model will determine the optimum time to replace equipment and will provide the user with a priority listing of this equipment. The priority list will be based on a cost-benefit relationship as well as allow the user to assign an equipment importance factor to each vehicle. This will show the relative importance of each vehicle to the fleet.

4.2 EQUIPMENT INVENTORY MODULE

The equipment inventory module consists of a file containing information about each equipment item in the fleet. Figure 4.2 shows the type of information to be compiled.

The identification number can be determined in any form by the user. The only requirement in selecting these numbers, is that they be unique to each vehicle.

EQUIPMENT INVENTORY MODULE

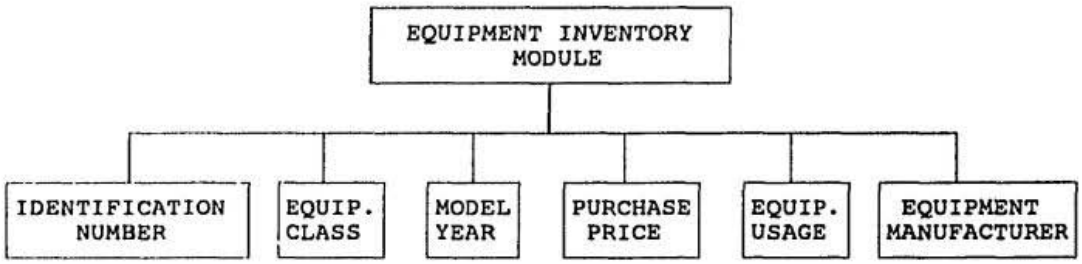


Figure 4.2

The equipment class is a description of the type of equipment being studied. Appendix F gives a listing of most types of equipment used by public agencies.

The model year indicates when the vehicle was manufactured.

The purchase price is the original price paid by the public agency for the equipment. This will be used in the priority module.

The equipment usage is the annual number of hours the machine worked in a given year.

The equipment manufacturer is the producer of the equipment.

4.3 EQUIPMENT COST MODULE

The equipment cost module, is a record of annual equipment costs. Each of the equipment cost factors discussed in Section 2.0 will be incorporated into this module.

This module consists of separate files which record the annual costs for each factor. They are then integrated into one file, where the total annual costs are compiled for use in the forecasting and replacement modules.

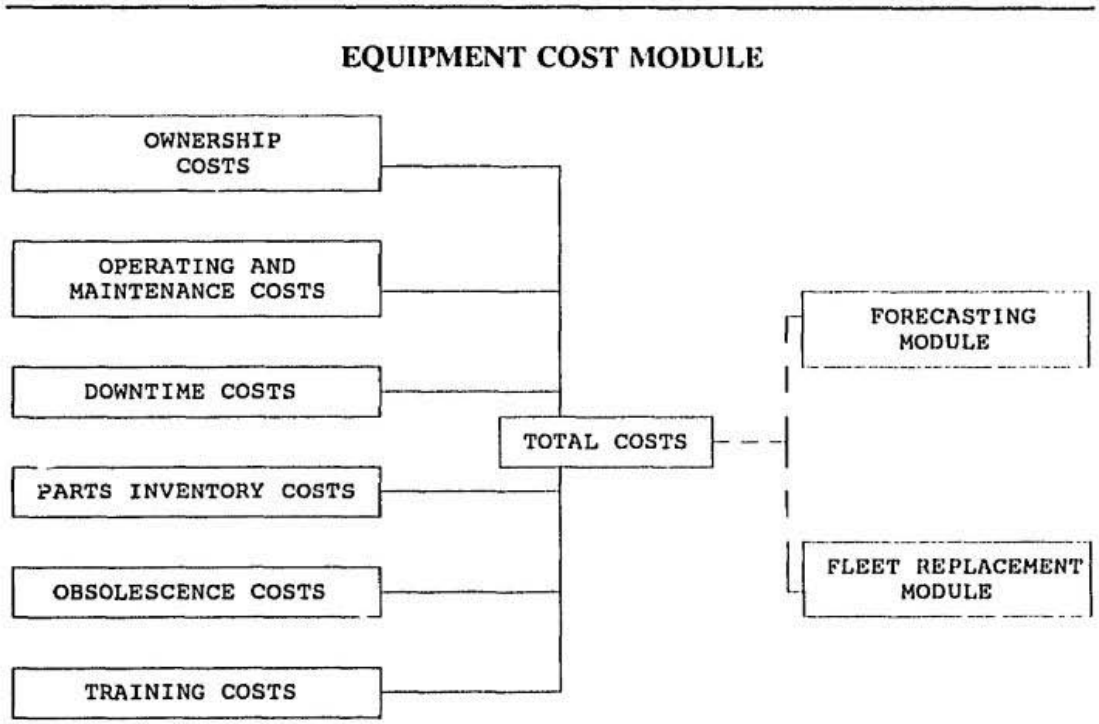


Figure 4.3

The accuracy of the recorded data in this module is an important factor in the validity of the results obtained in the forecasting, replacement and priority modules.

4.4 FORECASTING MODULE

The forecasting module is the mechanism where equipment's future costs are predicted. Any of the forecasting techniques discussed in Section 3.1, can be used in this

module. The primary objective of this module is to determine the predicted next year cost for use in the replacement and priority modules.

4.5 REPLACEMENT MODULE

This module utilizes data from the equipment cost module and forecasting modules discussed in Sections 4.3 and 4.4, respectively. The purpose of this module is to determine when equipment costs are minimum. Using data base functions, the module will provide the user with a listing of equipment replacement candidates. The candidates will then be used in the priority module.

4.6 PRIORITY MODULE

This is the final stage of the FRAPOF Model process. This module uses information from the equipment inventory, cost, forecasting and replacement modules, to provide the user with a priority listing of equipment to be replaced. The module calculates a replacement priority factor for each equipment replacement candidate. This factor is based on the following formula:

$$F_p = \frac{C_t + C_{t+1} - S_{t+1}}{P_r} \qquad \text{Equation 4-1}$$

Where

F_p = Priority Factor

C_t = Total Cost to Date Including Ownership Costs

C_{t+1} = Forecasted Equipment Cost Next Year

S_{t+1} = Salvage Value of Equipment Next Year

P_r = Purchase Price of a New Replacement Vehicle

This is the ratio of total equipment cost including the predicted next year cost to the purchase price of the new replacement vehicle.

Chapter 5

IMPLEMENTING THE FRAPOF MODEL WITH AN EXISTING FLEET

5.1 INTRODUCTION

The FRAPOF Model described in Chapter 4, has been implemented with a publicly owned fleet consisting of 252 vehicles. The total value of this fleet has been estimated to be approximately $15,500,000. This agency budgets $1,500,000 annually for equipment replacement, but, this amount has been reduced in some years by as much as $500,000 due to budgetary restraints.

The agency does use a fleet management model which was prepared by a consulting firm. The model did not perform up to the expectations of the agency. The model was modified by the agency's own staff to produce a fleet replacement priority list that was eventually acceptable to the agency.

This model continues to be used by the agency although it is uncertain if the model produces a true economic life cycle replacement program.

Annual capital budgets for the agency are approved during the months of April or May each year. Typically, once approval is given, tenders are called and equipment if finally received, a period of 6 months has passed. No method of forecasting is used by the agency that would allow for this delay in receiving the new equipment.

5.2 FRAPOF EQUIPMENT INVENTORY MODULE

The following section deals with the implementation of the equipment inventory module with the public agency. This module follows the format outlined in Section 4.2. Appendix G shows the equipment inventory spreadsheet for this fleet.

5.2.1 Equipment Unit Numbers

The unit numbers chosen by the public agency were developed to provide the following information:

1. Manufacturer
2. Classification of Equipment
3. Model Year
4. Identification Number

Figure 5.1 illustrates how the equipment unit numbers were developed by the agency.

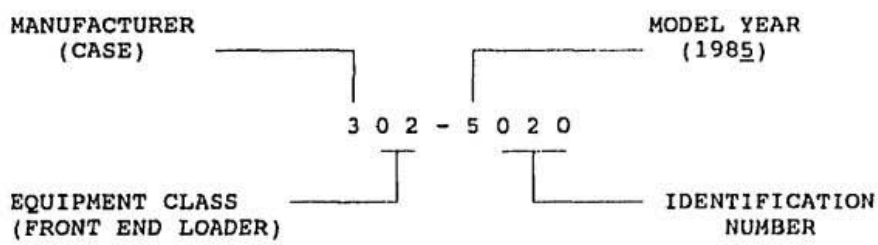


Figure 5.1

5.2.2 Equipment Classification, Model, Manufacturer, and Purchase Price

This data is in the equipment inventory module for the purpose of quick reference for personnel not familiar with the unit number coding. By simply looking at each unit number, the user can get a description of the particular equipment item.

The purchase price of the equipment item is provided for two reasons:

1. It provides the user with a record of the equipment item cost.
2. This data is used in the replacement module to determine the annual ownership cost of the particular unit. The ownership cost in this case is the annual depreciation of the equipment item.

5.2.3 Annual Usage Hours

The annual usage hours are included in this module for two purposes:

1. It gives the user a record of annual usage on particular equipment items.
2. These hours can be used by the fleet manager for the purpose of standardizing the equipment cost of machines that have relatively low usage compared to other vehicles in the same classification. This is discussed in Section 2.2.7.

The annual usage hours for this agency's fleet were incomplete and, therefore, not used for analysis purposes in this model.

Figure 5.2 shows the first sheet of the equipment inventory module for this fleet.

EQUIPMENT INVENTORY MODULE

PRESENT YEAR : 1991
LAST UPDATE : NOV.15/91

UNIT #		EQUIPMENT CLASS	MODEL	MANUFACTURER	ORIGNAL PURCHASE PRICE	ANNUAL USAGE (HOURS) 1983	1984	1985	1986	1987	1988	1989	1990	1991
6	9013	Portable Compressor	1989	INGERSOL RAND	$15,000									
6	9021	Portable Compressor	1989	INGERSOL RAND	$15,000									
6	9039	Portable Compressor	1989	INGERSOL RAND	$15,000									
6	1101	Portable Compressor	1981	INGERSOL RAND	$8,000									
604	109	Sidewalk Plows	1981	BOMBARDIER	$35,000									
604	117	Sidewalk Plows	1981	BOMBARDIER	$35,000									
604	125	Sidewalk Plows	1981	BOMBARDIER	$35,000									
604	9290	Sidewalk Plows	1989	BOMBARDIER	$55,000									
74	8194	Sidewalk Plows	1988	TRACKLESS	$52,000									
74	6156	Sidewalk Plows	1986	TRACKLESS	$48,000									
74	6222	Sidewalk Plows	1986	TRACKLESS	$48,000									
74	7220	Sidewalk Plows	1987	TRACKLESS	$50,000									
74	8202	Sidewalk Plows	1988	TRACKLESS	$52,000									
74	9184	Sidewalk Plows	1989	TRACKLESS	$55,000									
74	9168	Sidewalk Plows	1989	TRACKLESS	$55,000									
102	7598	Loader	1987	MICHIGAN	$118,000									
302	3512	Loader	1973	CASE	$51,000									
102	7606	Loader	1987	MICHIGAN	$118,000									
302	5608	Loader	1975	CASE	$55,000									
402	9369	Loader	1989	CATERPILLAR	$110,000									

Figure 5.2

5.3 FRAPOF EQUIPMENT COST MODULE

The following section discusses the implementation of the equipment cost module of the FRAPOF Model as described in Section 4.3.

5.3.1 Ownership Costs

The only ownership cost used by this agency was depreciation. This was calculated based on straight line depreciation as described in Section 2.2.1.1 using a Lotus 1-2-3 spreadsheet. Appendix H shows a typical ownership cost spreadsheet for this fleet. Figure 5.3.1 shows the first sheet of the ownership cost module for this fleet.

5.3.2 Operating and Maintenance Costs

Operating and maintenance costs (O&M) for the fleet were obtained from the agency's fleet cost data records. This data has been compiled by the agency since 1983. Information on equipment data prior to this date was not available. Figure 5.3.2 shows the first sheet of the O&M Cost Module for this fleet.

The O&M spreadsheet for this fleet is shown in Appendix I.

5.3.3 Downtime, Parts, Obsolescence, and Training Costs

The agency did not have cost data for any of these cost factors that was in a useful form. Any information available was either incomplete or inaccurate.

OWNERSHIP COST MODULE

PRESENT YEAR : 1991
LAST UPDATE : NOV.15/91

UNIT #	EQUIPMENT CLASS	MODEL	ORIGNAL PURCHASE PRICE	LIFE EXPECT	ANNUAL EQUIPMENT DEPRECIATION 1983	1984	1985	1986	1987	1988	1989	1990	1991	NEXT YEAR 1992
6 9013	Portable Compressor	1989	$15,000	7	0	0	0	0	0	0	2,143	2,143	2,143	2,143
6 9021	Portable Compressor	1989	$15,000	7	0	0	0	0	0	0	2,143	2,143	2,143	2,143
6 9039	Portable Compressor	1989	$15,000	7	0	0	0	0	0	0	2,143	2,143	2,143	2,143
6 1101	Portable Compressor	1981	$8,000	7	1,143	1,143	1,143	1,143	1,143	1,143	0	0	0	0
604 0109	Sidewalk Plows	1981	$35,000	6	5,833	5,833	5,833	5,833	5,833	0	0	0	0	0
604 0117	Sidewalk Plows	1981	$35,000	6	5,833	5,833	5,833	5,833	5,833	0	0	0	0	0
604 0125	Sidewalk Plows	1981	$35,000	6	5,833	5,833	5,833	5,833	5,833	0	0	0	0	0
604 9290	Sidewalk Plows	1989	$55,000	6	0	0	0	0	0	0	9,167	9,167	9,167	9,167
74 8194	Sidewalk Plows	1988	$52,000	6	0	0	0	0	0	8,667	8,667	8,667	8,667	8,667
74 6156	Sidewalk Plows	1986	$48,000	6	0	0	0	8,000	8,000	8,000	8,000	8,000	8,000	8,000
74 6222	Sidewalk Plows	1986	$48,000	6	0	0	0	8,000	8,000	8,000	8,000	8,000	8,000	8,000
74 7220	Sidewalk Plows	1987	$50,000	6	0	0	0	0	8,333	8,333	8,333	8,333	8,333	8,333
74 8202	Sidewalk Plows	1988	$52,000	6	0	0	0	0	0	8,667	8,667	8,667	8,667	8,667
74 9184	Sidewalk Plows	1989	$55,000	6	0	0	0	0	0	0	9,167	9,167	9,167	9,167
74 9168	Sidewalk Plows	1989	$55,000	6	0	0	0	0	0	0	9,167	9,167	9,167	9,167
102 7598	Loader	1987	$118,000	12	0	0	0	0	9,833	9,833	9,833	9,833	9,833	9,833
302 3512	Loader	1973	$51,000	12	4,250	4,250	4,250	0	0	0	0	0	0	0
102 7606	Loader	1987	$118,000	12	0	0	0	0	9,833	9,833	9,833	9,833	9,833	9,833
302 5608	Loader	1975	$55,000	12	4,583	4,583	4,583	4,583	4,583	0	0	0	0	0

Figure 5.3.1

O & M COST MODULE

PRESENT YEAR : 1991
LAST UPDATE . NOV.15/91

UNIT #		EQUIPMENT CLASS	MODEL	ANNUAL EQUIPMENT O & M COSTS 1983	1984	1985	1986	1987	1988	1989	1990	1991	YEAR TO-DATE COSTS
6	9013	Portable Compressor	1989						503	605	2,500	1,524	$5,132
6	9021	Portable Compressor	1989							1,180	2,667	2,670	$6,517
6	9039	Portable Compressor	1989							840	825	1,620	$3,285
6	1101	Portable Compressor	1981	825	1,984	2,988	2,964	1,679	2,305	2,470	2,400	2,100	$19,715
604	109	Sidewalk Plows	1981	6,012	5,867	16,588	14,169	14,479	15,140	15,060	22,120	12,430	$121,865
604	117	Sidewalk Plows	1981	2,748	5,159	10,154	9,175	16,392	15,735	15,760	13,065	9,486	$97,674
604	125	Sidewalk Plows	1981	2,128	4,737	13,673	5,343	20,046	14,710	14,699	12,658	15,520	$103,514
604	9290	Sidewalk Plows	1989							7,305	6,811	18,845	$32,961
74	8194	Sidewalk Plows	1988						18,964	19,950	47,450	42,354	$128,718
74	6156	Sidewalk Plows	1986					17,343	19,393	25,150	26,235	14,400	$102,521
74	6222	Sidewalk Plows	1986				5,747	24,819	25,002	22,430	28,233	20,469	$126,700
74	7220	Sidewalk Plows	1987					10,716	22,144	22,013	10,715	15,200	$80,788
74	8202	Sidewalk Plows	1988						16,990	16,032	23,280	16,200	$72,502
74	9184	Sidewalk Plows	1989							8,070	47,435	4,644	$60,149
74	9168	Sidewalk Plows	1989							15,900	11,470	20,077	$47,447
102	7598	Loader	1987						16,715	19,121	20,120	21,730	$77,686
302	3512	Loader	1973	31,382	29,006	35,872	32,331	46,115	22,750	22,364	22,370	22,467	$224,657
102	7606	Loader	1987						18,014	18,129	19,034	22,188	$77,365
302	5608	Loader	1975	33,165	12,507	27,402	34,501	40,836	37,724	38,862	12,619	60,123	$297,739
402	9369	Loader	1989							7,507	15,390	23,830	$46,727

Figure 5.3.2

5.4 FRAPOF FORECASTING MODULE

The forecasting module used for this fleet, utilizes all cost data available in the equipment cost modules discussed in Section 5.3. The total equipment cost for each equipment item is compiled in this module. A forecasting model, using the method of least squares, calculates the total equipment cost for the "next year". Figure 5.4 shows the first sheet of the Forecasting Module for this fleet. Appendix J shows a typical module spreadsheet for this fleet.

5.5 FRAPOF REPLACEMENT MODULE

The FRAPOF replacement module uses data from the cost and forecasting modules, previously discussed, to determine if an equipment item requires replacement. From Figure 2.3, it can be seen that equipment costs are minimum when the difference in the equipment item's annual ownership cost and total equipment cost is minimum. The FRAPOF replacement module uses this theory to determine if equipment replacement is required. Figure 5.5 shows the first sheet of the Equipment Replacement Module for this fleet.

Appendix K shows a typical FRAPOF replacement spreadsheet for this fleet.

	PRESENT YEAR:	1991							FORECASTING MODULE FOR YEAR:										1992						COST	EQUIP.
			O & M COSTS FOR THE YEAR:																SUM	SUM		SUM	SUM		NEXT	COST
UNIT #	EQUIP. CLASS	MODEL	1983	1984	1985	1986	1987	1988	1989	1990	1991	X1	X2	X3	X4	X5	X6	X7	X8	X9	Y's	X's	#	XY's	X2	COEFF.	CONST.	YEAR	NEW
6	9013	Portable Compressor	1989						503	605	2,500	1,524	0	0	0	0	0	1	2	3	4	5132	10	4	15309	30	455.8	49.5	$2,523	$1
6	9021	Portable Compressor	1989							1,180	2,667	2,670	0	0	0	0	0	0	1	2	3	6517	6	3	14524	14	745.0	582.3	$3,662	$3,...
6	9039	Portable Compressor	1989							840	825	1,620	0	0	0	0	0	0	1	2	3	3285	6	3	7350	14	390.0	315.0	$1,875	$20,600
6	1101	Portable Compressor	1981	825	1,584	2,988	2,964	1,579	2,305	2,470	2,400	2,100	1	2	3	4	5	6	7	8	9	15715	45	9	103228	285	77.6	1802.8	$2,579	$20,600
604	109	Sidewalk Plows	1981	6,012	5,867	16,568	14,169	14,475	15,140	15,060	22,120	12,430	1	2	3	4	5	6	7	8	9	121965	45	9	681671	285	1225.8	7511.7	$19,569	$82,400
604	117	Sidewalk Plows	1981	2,748	5,159	10,154	9,175	16,392	15,735	15,760	13,065	9,485	1	2	3	4	5	6	7	8	9	97574	45	9	556812	285	1140.7	5145.2	$16,556	$82,400
604	125	Sidewalk Plows	1981	2,128	4,707	13,673	5,343	28,046	14,710	14,699	12,658	15,520	1	2	3	4	5	6	7	8	9	160514	45	9	606328	285	1479.2	4195.7	$18,897	$82,400
604	9250	Sidewalk Plows	1988						7,305	6,911	18,845	0	0	0	0	0	0	0	1	2	3	33561	6	3	77462	14	5770.0	-533.0	$22,527	$82,400
74	8194	Sidewalk Plows	1988						16,964	19,950	47,450	42,554	0	0	0	0	0	1	2	3	4	139718	10	4	370630	30	9757.0	7792.0	$56,597	$82,400
74	8196	Sidewalk Plows	1986					17,343	19,953	25,150	26,295	14,400	0	0	0	0	1	2	3	4	5	102521	15	5	306519	55	95.6	20217.4	$20,791	$82,400
74	8222	Sidewalk Plows	1986				5,747	24,819	25,002	22,430	26,230	20,469	0	0	0	1	2	3	4	5	6	135700	21	6	484090	91	2002.3	12986.7	$28,245	$82,400
74	7223	Sidewalk Plows	1987					10,716	22,144	22,013	10,715	15,200	0	0	0	0	1	2	3	4	5	80768	15	5	239903	55	-346.1	16895.9	$15,419	$82,400
74	8202	Sidewalk Plows	1988						16,990	16,032	23,280	16,200	0	0	0	0	0	1	2	3	4	72502	10	4	180694	30	467.8	16906.0	$19,345	$82,400
74	9184	Sidewalk Plows	1989							8,070	47,435	4,644	0	0	0	0	0	0	1	2	3	60149	6	3	116872	14	-1713.0	23475.7	$16,624	$82,400
74	9168	Sidewalk Plows	1989							15,900	11,470	20,077	0	0	0	0	0	0	1	2	3	47447	6	3	99071	14	2088.5	11638.7	$19,995	$82,400
102	7598	Loader	1987						16,715	19,121	20,120	21,730	0	0	0	0	0	1	2	3	4	77686	10	4	202237	30	1604.4	15410.5	$23,433	$160,000
302	3512	Loader	1973	31,382	29,006	35,672	32,331	46,115	22,750	22,364	2,370	2,457	1	2	3	4	5	6	7	8	9	224657	45	9	891120	285	-3869.4	44309.0	$5,615	$160,000
102	7605	Loader	1987						16,014	18,125	19,034	22,188	0	0	0	0	0	1	2	3	4	77365	10	4	200126	30	1342.7	15364.5	$22,696	$160,000
302	5508	Loader	1975	33,165	12,507	27,402	34,501	40,836	37,724	38,862	12,819	60,123	1	2	3	4	5	6	7	8	9	257739	45	9	1620006	285	2236.5	21869.5	$44,275	$160,000
402	9369	Loader	1989							7,507	15,390	23,830	0	0	0	0	0	0	1	2	3	45727	6	3	109777	14	8161.5	-747.3	$31,899	$160,000
402	9377	Loader	1989							8,725	14,535	23,299	0	0	0	0	0	0	1	2	3	46559	6	3	107892	14	7257.0	945.7	$30,964	$160,000
102	6012	Loader	1986					22,255	39,020	39,406	31,155	32,170	0	0	0	0	1	2	3	4	5	164006	15	5	503965	55	1196.5	25210.5	$36,390	$160,000
102	6020	Loader	1986					24,226	41,011	43,826	21,696	32,740	0	0	0	0	1	2	3	4	5	162206	15	5	487640	55	-227.5	33343.7	$31,979	$160,000

Figure 5.4

EQUIPMENT REPLACEMENT MODULE

PRESENT YEAR: 1991
LAST UPDATE: NOV.15/91

UNIT #	EQUIPMENT CLASS	MODEL	COST NEW	ANNUAL OWNERSHIP EQUIPMENT COSTS 1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	FORECAST ANNUAL EQUIPMENT O&M COSTS 1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	REPLACE EQUIP.? FORECAST (YES=1; NO=0)
6	9010 Portable Compressor	1989	20,500	0	0	0	0	0	0	15,000	12,857	10,714	8,571							0	655	2,500	1,524	2,525	0
6	9021 Portable Compressor	1989	20,500	0	0	0	0	0	0	15,000	12,857	10,714	8,571								1,180	2,667	2,670	3,992	0
6	9036 Portable Compressor	1989	20,500	0	0	0	0	0	0	15,000	12,857	10,714	8,571								840	825	1,820	1,875	0
6	1101 Portable Compressor	1981	20,500	5,714	4,571	3,429	2,286	1,143	0	0	0	0	0	825	1,964	2,968	2,964	1,679	2,305	2,470	2,400	2,100	2,578	1
604	109 Sidewalk Plows	1981	62,400	23,333	17,500	11,667	5,833	0	0	0	0	0	0	6,012	5,867	16,588	14,169	14,479	15,140	15,060	22,120	12,430	19,569	1
604	117 Sidewalk Plows	1981	62,400	23,333	17,500	11,667	5,833	0	0	0	0	0	0	2,748	5,159	10,154	9,175	16,392	15,735	15,760	13,065	9,466	16,556	1
604	125 Sidewalk Plows	1981	62,400	23,333	17,500	11,667	5,833	0	0	0	0	0	0	2,128	4,737	13,673	5,343	20,048	14,710	14,899	12,658	15,520	18,897	1
604	9292 Sidewalk Plows	1989	62,400	0	0	0	0	0	0	55,000	45,833	38,667	27,500							7,305	8,811	18,645	22,527	0
74	8194 Sidewalk Plows	1988	62,400	0	0	0	0	0	52,000	43,333	34,667	26,000	17,333							16,964	19,950	47,450	42,354	56,597	1
74	6156 Sidewalk Plows	1986	62,400	0	0	0	48,000	40,000	32,000	24,000	16,000	8,000	0							17,345	19,383	25,150	28,235	14,466	20,791	1
74	6222 Sidewalk Plows	1986	62,400	0	0	0	48,000	40,000	32,000	24,000	16,000	8,000	0							5,747	24,519	25,002	22,430	28,233	20,469	29,245	1
74	7229 Sidewalk Plows	1987	62,400	0	0	0	0	50,000	41,667	33,333	25,000	16,667	8,333								10,716	22,144	22,012	10,715	15,206	15,419	1
74	8282 Sidewalk Plows	1988	62,400	0	0	0	0	0	52,000	43,333	34,667	26,000	17,333								16,990	16,032	23,260	16,200	16,345	1
74	9184 Sidewalk Plows	1989	62,400	0	0	0	0	0	0	55,000	45,833	36,667	27,500								8,070	47,435	4,644	16,624	0
74	9188 Sidewalk Plows	1989	62,400	0	0	0	0	0	0	55,000	45,833	36,667	27,500								15,990	11,470	20,077	19,993	0
102	7598 Loader	1987	150,000	0	0	0	0	118,000	106,167	98,333	88,500	78,667	68,833								16,715	19,121	20,120	21,730	23,433	0
302	3512 Loader	1973	150,000	8,500	4,250	0	0	0	0	0	0	0	0	31,382	29,006	35,872	32,331	46,115	22,750	22,364	22,370	22,467	5,615	1
102	7506 Loader	1987	150,000	0	0	0	0	118,000	106,167	98,333	88,500	78,667	68,833								18,014	18,129	19,034	22,188	22,998	0
302	5609 Loader	1975	150,000	18,333	13,750	9,167	4,583	0	0	0	0	0	0	33,165	12,507	27,402	34,501	43,836	37,724	38,862	12,819	60,123	44,275	1
402	9369 Loader	1989	150,000	0	0	0	0	0	0	110,000	100,833	91,667	82,500								7,507	15,390	23,830	31,699	0

Figure 5.5

5.6 FRAPOF PRIORITY MODULE

The order in which equipment, identified for replacement in the previous section, is to be replaced is determined in the FRAPOF priority module. This module determines a priority factor for each equipment item based on the ratio of the sum of the total equipment costs to date, to the cost to purchase a similar new equipment item. This is shown in Equation 4-1. This module also provides the user with a cumulative purchase price column, where any budgetary cut-off line can be drawn. Figure 5.6 shows the first sheet of the Equipment Replacement Priority Module for this fleet. Appendix L shows a typical priority module spreadsheet for this fleet.

5.7 DISCUSSION OF FRAPOF RESULTS FOR THIS FLEET

If all equipment listed on the priority module spreadsheet were to be replaced, the total monies required would be $10,160,000. The annual equipment budget for this agency is $1,500,000. It is obvious that this agency will have to increase its annual equipment budget, if it is to take advantage of the benefits of the economic life of its equipment. Mechanical repair costs for this fleet are likely to increase if equipment replacement is performed at its present rate. It is interesting to note that the total monies required for mechanical repairs to equipment in this fleet is approximately $4,900,000 per year (1991 dollars).

EQUIPMENT REPLACEMENT PRIORITY MODULE

PRESENT YEAR: 1991
LAST UPDATE: NOV 15/91

UNIT #	EQUIPMENT CLASS	MODEL	COST NEW	ANNUAL SALVAGE VALUE 1983	1984	1985	1986	1987	1988	1989	1990	1991	FORE-CAST 1992	ANNUAL EQUIPMENT O&M COSTS 1983	1984	1985	1986	1987	1988	1989	1990	1991	FORE-CAST 1992	PRIORITY FACTOR	CUMU-LATIVE NEW COST
110 5030	1/2 Ton Pickup	1985	$14,700	0	0	9,500	7,125	4,750	2,375	0	0	0	0			2,964	4,704	6,318	16,005	15,028	9,530	17,268	$19,004	6.160	$14,700
111 5286	One Ton Truck	1985	$20,400	0	0	13,200	9,900	6,600	3,300	0	0	0	0			1,555	6,284	8,552	13,934	15,599	11,153	21,379	$22,101	4.929	$35,100
110 6152	1/2 Ton Pickup	1986	$14,700	0	0	0	10,000	7,500	5,000	2,500	0	0	0				1,929	5,016	6,300	6,724	14,200	15,300	$17,728	4.571	$49,800
112 5244	VAN	1985	$17,500	0	0	12,400	9,300	6,200	3,100	0	0	0	0			5,054	9,406	5,884	11,240	12,685	11,545	10,399	$13,332	4.545	$67,300
210 7100	1/2 Ton Pickup	1987	$14,700	0	0	0	0	13,200	9,900	6,600	3,300	0	0				2,221	13,560	13,667	8,824	11,400	$14,021	4.333	$82,000
111 5294	One Ton Truck	1985	$20,400	0	0	13,200	9,900	6,600	3,300	0	0	0	0			3,179	7,832	7,759	15,029	14,663	12,300	11,010	$15,872	4.296	$102,400
211 8467	One Ton Truck	1988	$20,400	0	0	0	0	0	14,800	11,100	7,400	3,700	0					8,769	9,814	20,348	20,028	$25,418	4.215	$122,800
210 6227	1/2 Ton Pickup	1986	$14,700	0	0	0	10,000	7,500	5,000	2,500	0	0	0					4,853	14,230	12,640	9,274	9,190	$11,153	4.173	$137,500
110 6244	1/2 Ton Pickup	1986	$14,700	0	0	0	10,000	7,500	5,000	2,500	0	0	0				3,271	12,757	9,443	11,148	12,250	3,532	$3,885	4.168	$152,200
111 8503	One Ton Truck	1988	$20,400	0	0	0	0	0	14,800	11,100	7,400	3,700	0						12,331	20,930	19,058	11,410	$11,024	4.032	$172,600
210 6201	1/2 Ton Pickup	1986	$14,700	0	0	0	10,000	7,500	5,000	2,500	0	0	0					4,584	11,043	11,708	8,015	11,160	$12,339	4.003	$187,300
110 5281	1/2 Ton Pickup	1985	$14,700	0	0	9,500	7,125	4,750	2,375	0	0	0	0			2,044	5,122	9,188	8,854	8,156	3,780	11,006	$10,160	3.953	$202,000
237 5129	Compact Cars	1985	$14,000	0	0	9,100	7,280	5,460	3,640	1,820	0	0	0					3,598	5,198	7,582	9,746	11,477	$13,609	3.857	$216,000
426 6298	Water Tanker	1986	$52,900	0	0	0	43,000	35,833	28,667	21,500	14,333	7,167	(0)					11,235	13,208	29,634	34,045	25,667	35,912	$41,217	3.804	$268,900
111 6367	One Ton Truck	1986	$20,400	0	0	0	12,500	9,375	6,250	3,125	0	0	0					6,201	7,457	7,874	13,129	15,817	$17,515	3.338	$288,300
210 7183	1/2 Ton Pickup	1987	$14,700	0	0	0	0	13,200	9,900	6,600	3,300	0	0					1,871	7,707	8,694	8,780	9,486	$12,197	3.337	$794,000
237 5145	Compact Cars	1985	$14,000	0	0	9,100	7,280	5,460	3,640	1,820	0	0	0					1,291	9,085	8,212	7,196	8,553	$10,510	3.322	$316,000
210 7118	1/2 Ton Pickup	1987	$14,700	0	0	0	0	13,200	9,900	6,600	3,300	0	0					2,484	6,434	6,159	6,895	12,972	$13,420	3.290	$402,700
218 5114	Compressor - Mount	1985	$25,000	0	0	16,000	13,714	11,429	9,143	6,857	4,571	2,286	(0)			3,492	6,377	9,488	13,023	10,195	11,835	12,766	$15,163	3.253	$457,700
416 5155	5 Ton Dump Truck	1985	$85,000	0	0	62,500	50,000	37,500	25,000	12,500	0	0	0				30,855	36,296	52,550	53,426	47,120	33,320	$46,828	3.162	$532,700
211 8495	One Ton Truck	1988	$20,400	0	0	0	0	0	14,800	11,100	7,400	3,700	0						8,576	7,448	9,670	18,823	$18,370	3.132	$572,100
425 2524	16 Yd collectomatic	1982	$97,800	48,000	42,000	35,000	28,000	21,000	14,000	7,000	0	0	0	9,532	21,491	24,581	33,639	25,182	57,820	58,829	20,045	19,640	$40,425	3.100	$670,900
211 8503	One Ton Truck	1988	$20,400	0	0	0	0	0	14,800	11,100	7,400	3,700	0						7,466	7,898	11,365	16,143	$16,963	3.079	$691,300

Figure 5.6

As one would expect, the equipment replacement priority list in Figure 5.6 shows most of the older machines as those with the highest priority to be replaced. This is because the salvage value of these vehicles is minimal and total maintenance costs are high. In cases where, a younger machine has a high replacement priority, the maintenance costs for these vehicles have been extremely high compared to vehicles of the same age in the same classification. The fleet owner may then be required to have a closer look at the machines and use good judgement before replacing such vehicles.

Chapter 6

CONCLUSIONS AND RECOMMENDATIONS

There are many challenges facing fleet managers in the 1990's.[20] Equipment is becoming more and more expensive to buy as well as maintain. To ensure monies allocated for fleet replacement are spent in a cost effective manner, the fleet manager must use an appropriate equipment replacement model.

A 1992 survey of public agencies indicated that most agencies do not receive the funding required to replace all equipment scheduled for replacement. In all cases, the respondents did not have a quantitative method of determining the priority of such replacements. Forecasting of future equipment costs was also an area not considered by these agencies.

The criteria used to determine a fleet replacement plan vary depending on whether the fleet being analyzed is publicly owned or privately owned. For publicly owned fleets, age, mileage, operating and maintenance costs, politics and safety are important. For privately owned fleets, depreciation, price, replacement timing, mileage, operating and maintenance costs, taxes, safety and company image are of primary importance. The respondents of the 1992 survey indicated that the criteria used by them were age, mileage, equipment costs or some combination of these factors.

Many fleet management software packages are available to the fleet manager from software vendors. The flexibility of these packages was found to be a problem for some agencies. It has been stated that most computerized fleet management packages are not

appropriate for municipal applications. Despite the variety of programs and systems available, many facts and fantasies arise after these systems are implemented.

Three types of analysis techniques are available to the fleet manager. They are the life cycle cost method, the interval life method and commercially prepared nomographs. Each of these methods involve varying levels of complexity. The type of method used by the fleet manager depends on the requirements of the public agency. Each method requires accurate equipment data. The validity of the fleet replacement plan produced, is dependent on the accuracy of this equipment data.

Forecasting of future equipment costs will help the fleet manager decide when equipment should be replaced before the end of its economic life. This will give the fleet manager the lead time necessary to order the new equipment and avoid any unnecessary expenditure on old equipment selected for replacement in the near future. Several forecasting techniques are available. Some of these include; the method of least squares, second degree polynomial curve fitting, logarithmic trend lines, moving averages, exponential smoothing and Box-Jenkins methods.

Fleet replacement analysis for publicly owned fleet (FRAPOF) should have the following characteristics:

1. It should be adaptable and easily modified by the user.
2. It must compile equipment data in a logical and concise manner.
3. It must have forecasting capabilities.
4. It must provide the user with a replacement priority list.

A fleet replacement model for publicly owned fleets (FRAPOF) proposed in this thesis, consists of five modules. These modules are:

1. The Equipment Inventory Module
2. The Equipment Cost Module
3. The Forecasting Module
4. The Fleet Replacement Module
5. The Priority Module

This model was used with an existing fleet of approximately 252 vehicles. The results of the equipment replacement analysis indicates that increased funding should be allocated to this agency's equipment budget.

REFERENCES

[1] Magnuson, M.P., Microcomputer Program Assists Planning for Fleet Funding, Public Works, November 1988.

[2] American Public Works Association, Software Library.

[3] Oliver Marketing Inc., AGECON Users Manual, 1987.

[4] American Public Works Association, Equipment Management Manual.

[5] MacNutt, G., Workshop on Equipment Replacement Analysis, Mainstern Atlantic Workshop, Halifax, 1987.

[6] Caterpillar Tractor Company, Perspective.

[7] I.C.M.A., Management of Local Public Works, 1985.

[8] National Association of Fleet Administrators, Fleet Management Manual, 1989.

[9] Mocsan, W., Our Own Fleet Management Package, APWA Reporter, March 1987.

[10] Burnett, W. J., Fleet Computer Systems: Fact and Fantasy, APWA Reporter, March 1992.

[11] Nunnally, S.W., Managing Construction Equipment, Prentice-Hall, 1977.

[12] Peurifoy, R.L., and Ledbetter, W.B., Construction Planning Equipment and Methods, McGraw-Hill, 1985.

[13] Caterpillar Tractor Company, Performance Handbook, Edition 19.

[14] Grant. E.L., Ireson, W.G., and Leavenworth, Principles of Engineering Economy. Wiley, 1976.

[15] Hamburg, M., Statistical Analysis for Decision Making, Harcourt Brace Jovanovich Inc., 1977

[16] Hoff, J.C., A Practical Guide to Box-Jenkins Forecasting, Wadsworth, 1983.

[17] Berenson, M.L. and Levine, D.M., Basic Business Statistics, Prentice Hall, 1986.

[18] Bails, D.G. and Peppers, L.C., Business Fluctuations: Forecasting Techniques and Applications, Prentice Hall, 1982.

[19] Lotus Development Corporation, Lotus 1-2-3 Users Manual, Version 3.1.

[20] Hillier, F. I., Fleet Management: The Challenge of the Nineties, Public Works, November 1989.

[21] Montgomery, D.C., and Johnson, L.A., Forecasting and Time Series Analysis, McGraw-Hill, 1976.

APPENDIX A

THE FLEET REPLACEMENT QUESTIONNAIRE

QUESTIONNAIRE

1. What method of Fleet Replacement Analysis does your organization use?

2. Does your organization use computer software for Fleet Replacement Analysis? (Please specify.)

3. Does this software do everything you would like it to do with respect to Fleet Replacement Analysis? (Please specify.)

4. Does your organization receive sufficient funds each year to replace all equipment which should be replaced, according to your Fleet Replacement Analysis?

5. If the answer to 4 above is **NO**, how do you decide the order in which equipment is to be replaced?

6. Who is responsible for Fleet Management in your organization?

   NAME: _____

   ADDRESS: _____

   PHONE: _____ FAX: _____

APPENDIX B

COMMERCIALLY AVAILABLE FLEET MANAGEMENT SOFTWARE

Analysis of Software

The following appendix provides information on software packages presently available for fleet management purposes. The software listed shows the program name, vendor, memory required, hardware requirements and a synopsis of the software.

Program name: AGECON

Vendor: Oliver Marketing Inc.

Suite 704

3455 Drummond Street

Montreal, Quebec

H3G 2R6

Memory required: 256K

Hardware: IBM-PC and IBM Compatible

Synopsis: Fleet replacement program which provides the user with information on when the economic replacement time occurs for specific equipment items. User required to input the purchase price of new similar equipment, operating and maintenance costs, and approximate resale value of existing equipment. Inquire for price.

Program name: MESIS

Vendor: ACT Computer Services Ltd.

1735-170 Street

Edmonton, Alberta

Canada T5M 3W7

Memory required: 640K

Hardware: IBM-PC, PC/XT, PC/AT; hard disk required.

Synopsis: Six modules for fleet management including fleet information and control; servicing and repairs, fuelling and preventative maintenance fleet safety, revenue accounting and fleet support. System design and application determines price, so inquire vendor.

Program name: EZ-FLEET

Vendor: ATE Management & Service

Technical Products Division

617 Vine Street / Ste.800

Cininatti, OH 45202

Memory required: 256K

Hardware: IBM-PC, PC/XT, PC/AT, Tandy 1000, 1200, 2000

Synopsis: Hand-held data collector inputs vehicle check to personal computer. Reports service flow by station, daily servicing statistics, exception report (vehicles not serviced), pm schedule, fluids usage exception report.

Program name: VEHICLE CONTROL PLUS

Vendor: Burke & Associates

14291 east Fourth Avenue

Suite 270

Aurora, Co 80011

Memory required: 512K

Hardware: IBM-PC, PC/XT, PC/AT, recommended 10 MEG Hard Disk

Synopsis: Interactive fleet management system. Processes single or multiple work orders. Allows reporting of history, repair order logs, fuel/oil purchase logs, PM scheduling with other sort capabilities. APWA, ATA or user defined classifying codes.

Program name: BTML/EMS

Vendor: Byrd, Tallamy, MacDonald and Lewis

2921 Telestar Court

Falls Church, VA 22402

Memory required: 256K

Hardware: IBM-PC, PC/XT, PC/AT

Synopsis: Inventory, pm scheduling and work orders, maintenance and repair tracking (by unit), shop management analysis (productivity and resource use), total user costs (by equipment class: operating expenses; overhead, depreciation, and replacement costs.

Program name: EQUIPMENT MANAGEMENT

Vendor: Carter Associates Inc.

2835 Camino Del Rio South

San Diego, CA 92108

Memory required: 640K

Hardware: IBM-PC, PC/XT, PC/AT

Synopsis: Data base manager. Includes fleet inventory, fuel and repair tracking, performance analysis, pm scheduling. Inquire vendor for price.

Program name: FLEET MANAGER

Vendor: Chesapeake Computer Group

600 Court Street

Portsmoth, VA 23704

Memory required: 256K

Hardware: IBM-PC, PC/XT, PC/AT; Apple II; requires hard disk.

Synopsis: Separate dbase modules include (1) accounting-billing, purchase history by part, life cycle costs for equipment-units and classes (2) parts inventory; monitors stock; (3) fuel/oil consumption; (4) cost analysis; (5) pm scheduling, and (6) repair analysis.

Program name: TREMAIN

Vendor: Cochrane Associates Inc.

Consulting Engineers

236 Huntington Avenue

Boston, MA 02115

Memory required: 256K

Hardware: IBM-PC, PC/XT, PC/AT, Apple

Synopsis: An equipment information, preventative maintenance scheduling and inventory management program. Price is for a lease/purchase plan, $500 to $800/month.

Program name: CFA-VHRS

Vendor: Computerized Fleet Analysis Inc.

205 West Worth Avenue

Villa Park IL 60181

Memory required: 128K

Hardware: IBM-PC, PC/XT, PC/AT

Synopsis: Tracks equipment maintenance and operating costs, analyzes repair detail, controls part inventory costs and analyzes part usage. Four modules: cost listing; maintenance reporting; detailed inventory listing; part usage tracking.

Program name: CON-TRONIX III

Vendor: Con-tronix

3663 East Garden Place

Oak Creek, WI 53154

Memory required: 512K

Hardware: IBM-PC, PC/XT, PC/AT

Synopsis: Covers equipment records and reports, parts inventory, generation of work orders. Created for wastewater treatment plant maintenance management.

Program name: MCMS

Vendor: Control Software Inc.

993 Old Eagleschool Rd.

Wayne, PA 19087

Memory required: 640K

Hardware: IBM 43XX, 30XX, OR 9370

Synopsis: Six mainframe modules for fleet equipment maintenance and support. Includes parts purchasing, warranty management, fluids, labour, tire control. Can handle from 50 to 10,000 pieces. Some applications for personal computer. Inquire vendor.

Program name: TIMS

Vendor: Coverdale, Gary

Bispac Systems

9256 Madison Avenue

Orangevale, CA 95662

Memory required: 256K

Hardware: IBM-PC, PC/XT, PC/AT

Synopsis: Vehicle maintenance reporting system which is work order driven. Maintains inventory levels and costs, computes costs per operating mile for each vehicle, broken down by parts, labour and fuel loads. Can establish PM alerts based on calendar or miles.

Program name: VMS

Vendor: Creighton, Rogerand Assoc.

274 Deleware Avenue

Delmar, NY 12054

Memory required: 128K

Hardware: IBM-PC, PC/XT, PC/AT

Synopsis: Provides vehicle data, including historical usage, fuel consumption, Y-T-D maintenance costs by vehicle component, tire mileage, key performance indicators and pm warnings; also fleet analysis on usage, fuel, maintenance costs. Also tire inventory report.

Program name: School Bus Management System

Vendor: Creighton, Roger Assoc.

Memory required: 128K

Hardware: IBM-PC, PC/XT, PC/AT

Synopsis: provides vehicle data, including historical usage, fuel consumption, Y-T-D maintenance costs by vehicle component, tire mileage, key performance indicators and pm warnings; also fleet analysis on usage, fuel, maintenance costs. Also tire inventory report.

Program name: GEMS

Vendor: Diagonal Data

9700 Newton Avenue

Bloomington, Mn 55431

Memory required: 512K

Hardware: IBM-PC, PC/XT, PC/AT

Synopsis: Six modules which integrate for management of fleet maintenance. Includes parts, fuel, equipment inventories. Tracks work orders, job costing. Provides exception reporting, equipment status, vehicle specifications, equipment replacement. Inquire price.

Program name: VEHICLE CTRL, VMRS

Vendor: Display Data Corporation

Executive Plaza IV

Hunt Valley, MD 21301

Memory required: 256K

Hardware: IBM-PC, PC/XT, PC/AT, Apple II+, Apple IIe

Synopsis: For 130 to 3500 units; analysis by unit of fuel/oil consumption, running and repair costs and repair order analysis; designed for truck fleets.

Program name: Equipment Maintenance Management System

Vendor: Elke Corporation

998 Zane Ave.,N.

Golden Valley, MN 55422

Memory required: 256K

Hardware: IBM-PC, PC-XT, PC-AT

Synopsis: Functions include machine specification tracking, preventative and predictive maintenance scheduling, component repair/cost history tracking. May be used in manufacturing, processing, mining, construction, municipalities and transportation fields.

Program name: Vehicle Cost Analyzer

Vendor: Ernst & Whinney

1225 Connecticut Ave.,N.W.

Washington D.C. 20036

Memory required: 128K

Hardware: IBM-PC, PC-XT, PC,AT; requires fixed disk.

Synopsis: Computes life cycle costs. Compares vehicles cost under alternative purchase decisions; maintenance policies; and replacement decisions. Facilitates sensitivity analysis of critical assumptions regarding inflation, capital costs, etc. Inquire price.

Program name: Fleet Controller

Vendor: Fleet Computing International inc.

P.O. Box 14698

Albuquerque, NM, 87191

Memory required: 512K

Hardware: IBM-PC, PC/XT, PC/AT; required hard disk

Synopsis: Uses MDBS, specialized database system to track systems, fluid usage (diesel fuel, engine oil, automatic transmission fluid) schedule pm, provide vehicle inventories, mechanic seniority lists, etc. Inquire vendor for price.

Program name: FLEET COST CONTROL

Vendor: Fleet Distribution Inc.

P.O. Box 98704

Atlanta, GA 30329

Memory required: 64K

Hardware: IBM-PC, PC/XT, PC/AT

Synopsis: Fleets from 10 to 1000 units. Output from daily fuel and repair data: (1) mileage and fuelling history; (2) fuel costing and disbursement, (3) unit repair history, and (4) analysis of shop outside vendor costs, mechanic hours.

Program name: Fleet Tracker/PC

Vendor: GTE Data Services

First Florida Tower

P.O. Box 1548

Tampa, FL 33601

Memory required: 640K

Hardware: IBM-PC, PC/XT; 20 MB hard disk

Synopsis: Tracks fleet maintenance operations : pm, repairs, parts inventory, mechanics, vendors, labour, parts location. Multi-user version can produce 80 reports. Inquire price from vendor.

Program name: MAINSAVER

Vendor: J. B. Systems, Inc.

21600 Oxnard St./#640

Woodland Hills, CA 91367

Memory required: 256K

Hardware: IBM-PC, HP-PC, Microdata PC, Wang PC, A T & T PC

Synopsis: Can generate corrective and pm work orders, tracks inventory and labour by equipment or facilities, maintenance history reports and cost reports. Vendor information management and automatic parts re-ordering optional. Inquire for price.

Program name: MAINTENANCE MANAGEMENT SYSTEM

Vendor: Jentech Controls, Inc.

Route 1, Box 93

Gresham, WI 54128

Memory required: 128K

Hardware: IBM-PC, XT, and IBM compatibles; Apple IIe

Synopsis: For up to 500 pieces of equipment; Five functions: (1) Manufactures information; (2) PM: scheduling by date or run hours; (3) Equipment run hours; (4) Work history; (5) Parts inventory; by part number, location, reorder report.

Program name: FLEET MAINTENANCE MODULE

Vendor: LWFW Group - GTE Intech

12700 Park Central /#1805

Dallas, TX 75251

Memory required: 640K

Hardware: IBM-PC, PC/XT, PC/AT

Synopsis: Compiles vehicle/equipment data; tracks preventative/predictive programs; analyzes proposed capital investments; relates resources to accomplished work; tracks employee performance; schedules work, analyzes services levels.

Program name: CHRIS

Vendor: MCS Group, Inc.

2465 West Chicago

Rapid City, SD 57702

Memory required: 256K

Hardware: IBM-PC, PC/XT, PC/AT

Synopsis: Tracks equipment usage and costs. Equipment make, model, serial number, plus maintenance scheduling, depreciation, MTD, YTD, accumulated direct cost breakdowns, repair & fuel costs per mile/hour. Cash flow budgeted expenses, etc. vs. actuals. Inquire price.

Program name: FLEET COMMAND

Vendor: Mainstem Corporation

130 Sewaren Avenue

Sewaren, NJ 07077-1299

Memory required: 640K

Hardware: Unisys B25

Synopsis: Ten modules for fleet management and support including equipment records,work order processing, mechanic productivity, pm scheduling, vendor info, parts inventory, fuel usage, billing. Primarily mainframe, but some p.c. applications. Inquire.

Program name: FLEET*MATE

Vendor: Multisystems, Inc.

1050 Massuchusetts Ave.

Cambridge, MA 02138

Memory required: 640K

Hardware: IBM-PC, PC/XT, PC/AT; hard disk required

Synopsis: Processes work orders, tracks daily mileages, fuelling, inspections repairs, vehicle histories. Maintains parts inventory; prompts user to reorder; posts costs and quantity adjustments; reports servicing, lists work orders. Inquire vendor for price.

Program name: VEMS

Vendor: National Business Control Systems

12703 A Research Blvd.

Austin, TX 78759

Memory required: 256K

Hardware: IBM-PC, PC/XT, PC/AT

Synopsis: Uses standard data codes developed by American Trucking Association. Features unit maintenance history, unit costs, cost per mile, hour or day, tracks life warranties and normal service expectations.

Program name: Penton/Maintenance series

Vendor: Penton Software Inc.

420 Lexington Ave.

Suite 2846

New York, NY 10017

Memory required: 512K

Hardware: IBM-PC, PC/XT, PC/AT

Synopsis: Four modules. I: scheduling, systems management; II: equipment history, purchase order tracking, spare parts; III: fixed asset system, warranty forms design; IV: voice recognition and maintenance capabilities. Inquire vendor for price.

Program name: EMS/PC

Vendor: Prototype Incorporated

S R Box 170 MKB

Kamuela, Hawaii 96743

Memory required: 512K

Hardware: IBM-PC, PC/XT, PC/AT

Synopsis: Fleet management program adapted for PC. Tracks parts and fuel, maintains dbase of work and purchase orders, keeps pm and repair histories, analyses labour, costs for repair and pm. Reports fuel and oil consumption.

Program name: LANTA PARTS INVENTORY PACKAGE

Vendor: TIME Support Center

Vanderbuilt University

P.O. Box 1563, Station B

Nashville, TN 37235

Memory required: 256K

Hardware: IBM-PC, PC/XT, PC/AT; hard disk recommended.

Synopsis: Uses dbase II, version 2.4. Parts inventory and analysis. Allows maintenance manager to track parts, quantities, locations. Best for small/medium sized transit agencies. Monitors incoming-outgoing parts, vendor info., value of current inventory.

Program name: UTILFLEET

Vendor: Tecnomics Micro Software

100 Ardmore Street

Blacksburg, VA 24060

Memory required: 256K

Hardware: IBM-PC, PC/XT, PC/AT, Radio Shack TRS-80

Synopsis: Monitors fuel, scheduled maintenance, repairs, insurance, licences, depreciation, and two other costs the user specifies. Computes and prints an individual report for each vehicle that shows itemized and total costs; produces cost comparison charts.

Program name: FLEET MAINTENANCE SYSTEM

Vendor: Turley, Ron and Associates

1642 West Sequoia

Phoenix, AZ 85027

Memory required: 128K

Hardware: IBM-PC, PC/XT, PC/AT; Novell Netware

Synopsis: Tracks vehicle costs, aids preventative maintenance scheduling; provides repair history. Also includes repair order system, fuel inventory and control, parts inventory. Optional: tire inventory and control; fuel state tax reporting. Price varies.

Program name: TASKFORCE

Vendor: Uniforce Corporation

Fleet Management Systems

P.O. Box 1299

Princeton, NJ 08542

Memory required: 640K

Hardware: IBM-PC, PC/XT, PC/AT; hard disk required.

Synopsis: One of four modules for fleet equipment maintenance management. Processes work orders; reports on exception; forecasts future pm; controls shop work; organizes backlog by priority & estimated labour. Inquire price from vendor.

Program name: VehicleCTRL

Vendor: Uniforce Corporation

Fleet Management Systems

P.O. Box 1299

Princeton, NJ 08542

Memory required: 640K

Hardware: Apple (130 units); IBM-PC (600 units); IBM-PC/XT (3500 units)

Synopsis: Automatically updates repair orders, fuel/oil purchases, and pm entries to appropriate unit record. Schedules pm up to one year. Reports vehicle histories, repair order logs, etc. Analyses total running costs for each vehicle. Inquire price.

Program name: DATAFORCE

Vendor: Uniforce Corporation

P.O. Box 1229

Princeton, NJ 08542

Memory required: 640K

Hardware: IBM- PC, PC/XT, PC/AT

Synopsis: One of four modules for fleet equipment maintenance management. Equipment data base including mechanic skills and personnel data. Also labour performance & analysis, parts, labour, fuel audits; budget allocation, replacement analysis.

Program name: PARTSFORCE

Vendor: Uniforce Corporation

Fleet Management Systems

P.O. Box 1229

Princeton, NJ 08542

Memory required: 640K

Hardware: IBM-PC, PC/XT, PC/AT; hard disk required.

Synopsis: One of four modules for fleet equipment maintenance management. Uses VandeMark Methods for inventory control and forecasting; calculates EOQ, order points, safety stock; tracks purchase orders; parts issues and transfers. Inquire vendor for prices.

Program name: MMS-II

Vendor: Unik Associates

12545 W. Burleigh

Brookfield, WI 53005

Memory required: 256K

Hardware: IBM-PC, PC/XT, PC/AT

Synopsis: Integrated system which produces pm schedules, work orders, parts and labour costs, equipment history, repair cost summary, downtime summary, parts inventory on hand, reorder points, and usage history.

Program name: MAINTENANCE MANAGEMENT

Vendor: Unik Associates

12545 W. Burleigh

Brookfield, WI 53005

Memory required: 128K

Hardware: IBM-PC, Apple IIe

Synopsis: Allows you to maintain records and generate reports on equipment history and pm, work orders and productivity, inventory control. Equipment history includes manufacturer, model, purchase date and location for each piece of equipment.

Program name: FMS: Fleet Maintenance Program

Vendor: Vector Solutions

1355 Terra VistaLane

Colorado Springs

Colorado 80911

Memory required: 256K

Hardware: IBM-PC, PC/XT, PC/AT

Synopsis: Covers six main service areas including work order, tire use, part use, fluid (fuel, oil, coolant, ATF, PSF) use, pm, and mechanic labour services. Manual anadem disk for $25.00. Inquire vendor for price.

Program name: FLMS

Vendor: Wood Technologies

4550 Kearny Villa Rd.

Suite 118

San Diego, Ca 92123

Memory required: 512K

Hardware: IBM-PC, PC/XT, PC/AT

Synopsis: Nine modules for integrated fleet equipment maintenance management including work orders, pm, emissions certification, labour analysis, pool vehicle, bulk fuel accounting, mechanic work assignments, vehicle analysis and charge back. Inquire.

APPENDIX C

EQUIPMENT REPLACEMENT ANALYSIS USING AVERAGE ANNUAL EQUIPMENT COST

Replacement Analysis Worksheet

$$\text{Mean Annual Cost} \quad MAC_R = \frac{P - S_R + \sum_{T=1}^{R} X_T}{R}$$

(1) Year [t]	(2) Original Purchase Price [P]	(3) Resale or Salvage Value [S_t]	(4) Depre-ciation [(2)-(3)] [$P-S_R$]	(5) Total Yearly Cost [X_t]	(6) Cummu-lative sum of Col. 5	(7) Total Costs	(8) Replace-ment Period [R]	(9) Mean Annual Vehicle Costs [(7)÷(8)] [MAC_R]
1	16,500	10,627	5,873	4,856	4,856	10,729	1	10,729
2	16,500	6,844	9,656	5,877	10,733	20,389	2	10,195
3	16,500	4,408	12,092	7,299	18,032	30,124	3	10,041*
4	16,500	2,839	13,661	8.520	26,552	40,213	4	10,053
5	16,500	1,828	14,672	9,741	36,293	50,965	5	10,193
6	16,500	1,177	15,323	10,963	47,256	62,579	6	10,430
7	16,500	758	15,742	12,184	59,440	75,182	7	10,740
8	16,500	488	16,012	13,306	72,746	88,758	8	11,095
9	16,500	315	16,185	14,427	87,173	103,358	9	11,484
10	16,500	203	16,297	15,448	102,621	118,918	10	11,892

* APWA Equipment Manual

APPENDIX D

OTHER EXPONENTIAL FORECASTING METHODS

Double and Triple Exponential Smoothing

The concept of exponential smoothing can be extended to certain cases where the demand changes over time. In Chapter 3, equation 3-16 gives the relationship for single exponential smoothing. If this formula is applied to the output of the initial smoothing function, this implies double exponential smoothing has occurred. This process can be repeated again so that triple exponential smoothing is achieved. These processes can be shown by the following equations.[21]

$$S_t = \propto X_t + (1 - \propto) S_{t-1}$$

$$S^2_t = \propto X_t + (1 - \propto) S^2_t$$

$$S^3_t = \propto X_t + (1 - \propto) S^3_t$$

Brown's Linear Exponential Smoothing

This linear-exponential smoothing technique uses the following rational. Since both single and double smoothing values log the actual data whenever a trend exists, the difference between these two values can be added to the single smoothed value and adjusted for trend. The basic equations used in this process are:

$$S^1_t = \propto Y_t + (1 - \propto) S^1_{t-1}$$

$$S^2_t = \propto S^1_t + (1 - \propto) S^2_{t-1}$$

Where

S^1_t = Single Smoothed Statistic

S^2_t = Double Smoothed Statistic

Winter's Method

This method applies the smoothing process three times:

1. To estimate the average value of the time series.
2. To estimate the trend component.
3. To estimate the seasonal index.

Each of the three stages has its own smoothing constant which can be adjusted as the situation warrants. These individual modifications can be made to any one of the constants without having to alter the others.

Adaptive-Response-Rate Exponential Smoothing

This method is conceptually similar to single exponential smoothing. The only difference is that the value of the smoothing constant varies. The value of $\propto$ adapts automatically whenever a change in the data pattern dictates that a change is desirable. The advantage of this method is that it

is capable of representing almost all data patterns. The basic equation for adaptive-response-rate exponential smoothing is:

$$\hat{Y}_{t+1} = \alpha_t Y_t + (1 - \alpha_t) \hat{Y}_t$$

Holt's Exponential Smoothing

Using this method, the trend present in the time series is dealt with by a smoothing constant that is different from the smoothing constant applied to the actual observations. This technique gives some extra flexibility to the analyst but it requires the use of two smoothing parameters. Since two parameters must be quantified, the trial and error process of finding the best combination of parameters may be costly and time-consuming. The basic equations in this method are:

$$S^h_t = \alpha Y_t + (1 - \alpha) (S^h_{t-1} + C_{t-1})$$

$$C_t = \beta(S^h_t - S^h_{t-1}) + (1 - \beta) C_{t-1}$$

APPENDIX E

BOX-JENKINS SOFTWARE PROGRAMS

Software Vendors of Box-Jenkins Programs

Organization	Address	Program Name(s)	Type of Models	Batch/ Conversational
Applied Decisions Systems, Inc.	33 Hayden Ave. Lexington, MA 02173	SIBYL/RUNNER	Univariate and Multivariate	Conversational
Automatic Forecasting Systems, Inc.	P.O. Box 563 Hatboro, PA 19040	PACK Systems and AUTOBJ	Univariate and Multivariate	Conversational and Batch
Gwilym Jenkins & Partners Ltd	1700 Echo Trail Norman, OK 73069	GENISIS	Univariate and Multivariate	Batch
IBM Corporation	Data Processing Division 1133 Westchester Avenue White Plains, NY 10604	APL Forecasting and Time Series Analysis	Univariate and Multivariate	
Charles R. Nelson Associations, Inc.	4921 N.E. 39th St. Seattle, WA	PDQ, et al.	Univariate and Multivariate	Conversational and Batch
SAS Institute, Inc.	P.O. Box 8000 Cory, NC	SAS	Univariate and Multivariate	Conversational and Batch
Scientific Computing Associates, Inc.	P.O. Box 625 DeKalb, IL 60115	The SCA System	Univariate Multivariate	Conversational and Batch
Statistical Laboratory, Iowa State University	c/o Bill Meeker Route 1 Ames, IA 50010	TSERIES	Univariate	Batch
BMDP Statistical Software, Inc.	1964 Westwood Boulevard Suite 202 Los Angles, CA 90025	BMDP	Univariate Multivariate	Conversational and Batch

APPENDIX F

PUBLIC AGENCY EQUIPMENT TYPES

Equipment Typically Used by Public Agencies

Portable Compressors

Sidewalk Plows

Loaders

1/2 Ton Pickups

1 Ton Pickups

Vans

Small Pickups

Garbage Trucks

Tanker Trucks

Automobiles

Street Brooms

Excavators

Backhoe Loaders

Gang Mowers

Snow Blower Attachments

Self Contained Snow Blowers

Compressor Trucks

Rollers

Dozers

Pothole Patchers

5 Ton Dump Trucks

Tandem Dump Trucks

Sewer Jet

Vacuum Trucks

Graders

Line Painters

Sewer Drags

APPENDIX G

FRAPOF EQUIPMENT INVENTORY MODULE

Instructions for Use of FRAPOF Model

The FRAPOF model consists of two groups of files on diskette. One group consists of the equipment cost files, the other group consisting of the analysis files. Each cost file contains data about the various cost factors described in previous chapters. The data in each of the cost files can be combined into one file called "ALLCOST.WK1" for use with the analysis files. This is done using the LOTUS command "FILE-COMBINE-ADD". The cost data files to be combined are as follows:

1. O&MCOST.WK1 - operating and maintenance costs
2. DOWNTIME.WK1 - downtime costs
3. PARTCOST.WK1 - parts inventory costs
4. TRAINING.WK1 - training costs
5. OBSOCOST.WK1 - obsolescence costs
6. OWNCOSTS.WK1 - ownership costs

The analysis files consist of the following files:

1. EQUIP91.WK1 - 1991 equipment inventory file
2. ALLCOST.WK1 - total equipment costs
3. FORECAST.WK1 - forecasting module
4. REPLACE.WK1 - replacement module
5. PRIORITY.WK1 - priority module

A description of these files is found in Chapter 4.

The Forecasting Module

Cost data from the file called ALLCOST.WK1 is used in the forecasting module file called FORECAST.WK1. By placing the cost data in the appropriate columns in the spreadsheet, LOTUS 1-2-3 calculates the next year cost by pressing the F9 function key.

The Replacement Module

Data from the forecasting module called FORECAST.WK1 is used in the replacement module called REPLACE.WK1. By placing the data in the appropriate columns, LOTUS 1-2-3 determines if the equipment items in the spreadsheet should be replaced. The F9 function key is used to perform this operation.

The Fleet Replacement Priority List

Prioritizing the fleet replacement list is done with the use of the "DATA SORT" command in LOTUS 1-2-3. The SORT is done using the replacement priority factor as the primary key in the DATA-SORT menu. This value is sorted in descending order. The resulting sort provides the user with a fleet replacement priority listing. The cumulative equipment cost column can be used to draw a line for any particular budget amount.

APPENDIX G EQUIPMENT INVENTORY MODULE

PRESENT YEAR : 1991
LAST UPDATE : NOV.15/91

UNIT #		EQUIPMENT CLASS	MODEL	MANUFACTURER	ORIGINAL PURCHASE PRICE	ANNUAL USAGE (HOURS) 1983	1984	1985	1986	1987	1988	1989	1990	1991
6	9013	Portable Compressor	1989	INGERSOL RAND	$15,000									
6	9021	Portable Compressor	1989	INGERSOL RAND	$15,000									
6	9039	Portable Compressor	1989	INGERSOL RAND	$15,000									
6	1101	Portable Compressor	1981	INGERSOL RAND	$8,000									
604	109	Sidewalk Plows	1981	BOMBARDIER	$35,000									
604	117	Sidewalk Plows	1981	BOMBARDIER	$35,000									
604	125	Sidewalk Plows	1981	BOMBARDIER	$35,000									
604	9290	Sidewalk Plows	1989	BOMBARDIER	$55,000									
74	8194	Sidewalk Plows	1988	TRACKLESS	$52,000									
74	6156	Sidewalk Plows	1986	TRACKLESS	$48,000									
74	6222	Sidewalk Plows	1986	TRACKLESS	$48,000									
74	7220	Sidewalk Plows	1987	TRACKLESS	$50,000									
74	8202	Sidewalk Plows	1988	TRACKLESS	$52,000									
74	9184	Sidewalk Plows	1989	TRACKLESS	$55,000									
74	9168	Sidewalk Plows	1989	TRACKLESS	$55,000									
102	7598	Loader	1987	MICHIGAN	$118,000									
302	3512	Loader	1973	CASE	$51,000									
102	7606	Loader	1987	MICHIGAN	$118,000									
302	5608	Loader	1975	CASE	$55,000									
402	9369	Loader	1989	CATERPILLAR	$110,000									

UNIT #		EQUIPMENT CLASS	MODEL	MANUFACTURER	ORIGINAL PURCHASE PRICE	ANNUAL USAGE (HOURS) 1983	1984	1985	1986	1987	1988	1989	1990	1991
402	9377	Loader	1989	CATERPILLAR	$110,000									
102	6012	Loader	1986	CASE	$117,000									
102	6020	Loader	1986	CASE	$117,000									
202	2127	Loader	1981	INTERNATIONAL	$85,000									
202	9163	Loader	1979	INTERNATIONAL	$73,000									
302	161	Loader	1980	CASE	$79,000									
302	5012	Loader	1985	CASE	$85,000									
302	5020	Loader	1985	CASE	$85,000									
402	442	Loader	1990	CATERPILLAR	$160,000									
402	434	Loader	1990	CATERPILLAR	$160,000									
402	459	Loader	1990	CATERPILLAR	$160,000									
110	9206	1/2 Ton Pickup	1989	CHEV	$13,800									
110	9214	1/2 Ton Pickup	1989	CHEV	$13,800									
110	9222	1/2 Ton Pickup	1989	CHEV	$13,800									
110	9230	1/2 Ton Pickup	1989	CHEV	$13,800									
110	9248	1/2 Ton Pickup	1989	CHEV	$13,800									
110	3399	1/2 Ton Pickup	1983	CHEV	$9,000									
110	9255	1/2 Ton Pickup	1989	CHEV	$13,800									
110	9263	1/2 Ton Pickup	1989	CHEV	$13,800									
110	9271	1/2 Ton Pickup	1989	CHEV	$13,800									
110	5030	1/2 Ton Pickup	1985	CHEV	$9,500									
110	5261	1/2 Ton Pickup	1985	CHEV	$9,500									
110	6152	1/2 Ton Pickup	1986	CHEV	$10,000									
110	6244	1/2 Ton Pickup	1986	CHEV	$10,000									

UNIT #		EQUIPMENT CLASS	MODEL	MANUFACTURER	ORIGINAL PURCHASE PRICE	ANNUAL USAGE (HOURS) 1983	1984	1985	1986	1987	1988	1989	1990	1991
110	6335	1/2 Ton Pickup	1986	CHEV	$10,000									
210	8389	1/2 Ton Pickup	1988	DODGE	$14,200									
210	8397	1/2 Ton Pickup	1988	DODGE	$14,200									
210	8405	1/2 Ton Pickup	1988	DODGE	$14,200									
210	8413	1/2 Ton Pickup	1988	DODGE	$14,200									
210	8421	1/2 Ton Pickup	1988	DODGE	$14,200									
210	8439	1/2 Ton Pickup	1988	DODGE	$14,200									
210	6201	1/2 Ton Pickup	1986	DODGE	$10,000									
210	6219	1/2 Ton Pickup	1986	DODGE	$10,000									
210	6227	1/2 Ton Pickup	1986	DODGE	$10,000									
210	6235	1/2 Ton Pickup	1986	DODGE	$13,200									
210	7050	1/2 Ton Pickup	1987	DODGE	$13,200									
210	7068	1/2 Ton Pickup	1987	DODGE	$13,200									
210	7092	1/2 Ton Pickup	1987	DODGE	$13,200									
210	7100	1/2 Ton Pickup	1987	DODGE	$13,200									
210	7118	1/2 Ton Pickup	1987	DODGE	$13,200									
210	7126	1/2 Ton Pickup	1987	DODGE	$13,200									
210	7134	1/2 Ton Pickup	1987	DODGE	$13,200									
210	7142	1/2 Ton Pickup	1987	DODGE	$13,200									
210	7159	1/2 Ton Pickup	1987	DODGE	$13,200									
210	7167	1/2 Ton Pickup	1987	DODGE	$13,200									
210	7175	1/2 Ton Pickup	1987	DODGE	$13,200									
210	7183	1/2 Ton Pickup	1987	DODGE	$13,200									
110	9099	1/2 Ton Pickup	1989	CHEV	$13,800									
210	139	1/2 Ton Pickup	1990	DODGE	$14,000									

UNIT #		EQUIPMENT CLASS	MODEL	MANUFACTURER	ORIGINAL PURCHASE PRICE	ANNUAL USAGE (HOURS) 1983	1984	1985	1986	1987	1988	1989	1990	1991
210	147	1/2 Ton Pickup	1990	DODGE	$14,000									
210	155	1/2 Ton Pickup	1990	DODGE	$14,000									
210	238	1/2 Ton Pickup	1990	DODGE	$14,000									
210	246	1/2 Ton Pickup	1990	DODGE	$14,000									
210	253	1/2 Ton Pickup	1990	DODGE	$14,000									
210	261	1/2 Ton Pickup	1990	DODGE	$14,000									
210	279	1/2 Ton Pickup	1990	DODGE	$14,000									
210	1152	1/2 Ton Pickup	1991	DODGE	$14,400									
111	8512	One Ton Truck	1988	CHEV	$14,800									
111	8538	One Ton Truck	1988	CHEV	$14,800									
111	5286	One Ton Truck	1985	CHEV	$13,200									
111	5294	One Ton Truck	1985	CHEV	$13,200									
111	6342	One Ton Truck	1986	CHEV	$12,500									
111	6359	One Ton Truck	1986	CHEV	$12,500									
111	6367	One Ton Truck	1986	CHEV	$12,500									
211	6259	One Ton Truck	1986	DODGE	$12,500									
211	7018	One Ton Truck	1987	DODGE	$13,300									
211	7026	One Ton Truck	1987	DODGE	$13,300									
211	8487	One Ton Truck	1988	DODGE	$14,800									
211	8503	One Ton Truck	1988	DODGE	$14,800									
211	9300	One Ton Truck	1989	DODGE	$16,000									
211	8495	One Ton Truck	1988	DODGE	$14,800									
211	7190	One Ton Truck	1987	DODGE	$13,300									

UNIT #		EQUIPMENT CLASS	MODEL	MANUFACTURER	ORIGNAL PURCHASE PRICE	ANNUAL USAGE (HOURS) 1983	1984	1985	1986	1987	1988	1989	1990	1991
211	13	One Ton Truck	1990	DODGE	$18,000									
211	54	One Ton Truck	1990	DODGE	$18,000									
211	302	One Ton Truck	1990	DODGE	$18,000									
211	9212	One Ton Truck	1989	DODGE	$16,000									
311	1168	One Ton Truck	1991	FORD	$20,400									
111	8520	One Ton Truck	1988	CHEV	$14,800									
211	1177	Utility Truck	1991	DODGE	$20,400									
113	8783	VAN	1988	CHEV	$14,000									
112	5244	VAN	1985	CHEV	$12,400									
212	6167	VAN	1986	DODGE	$13,700									
212	6175	VAN	1986	DODGE	$13,700									
212	6233	VAN	1986	DODGE	$13,700									
212	8577	VAN	1988	DODGE	$14,000									
312	8543	VAN	1988	FORD	$14,000									
112	96	VAN	1990	CHEV	$15,500									
112	104	VAN	1990	CHEV	$15,500									
112	112	VAN	1990	CHEV	$15,500									
212	46	VAN	1990	DODGE	$15,500									
212	61	VAN	1990	DODGE	$15,500									
212	79	VAN	1990	DODGE	$15,500									
212	87	VAN	1990	DODGE	$15,500									
212	285	VAN	1990	DODGE	$15,500									
212	293	VAN	1990	DODGE	$15,500									

UNIT #		EQUIPMENT CLASS	MODEL	MANUFACTURER	ORIGINAL PURCHASE PRICE	ANNUAL USAGE (HOURS) 1983	1984	1985	1986	1987	1988	1989	1990	1991
312	1209	VAN	1991	FORD	$17,500									
312	1217	VAN	1991	FORD	$17,500									
312	1365	VAN	1991	FORD	$17,500									
114	5085	Small Pick-up	1985	CHEV	$10,000									
114	8154	Small Pick-up	1988	CHEV	$14,000									
114	8378	Small Pick-up	1988	CHEV	$14,000									
214	9839	Small Pick-up	1989	DODGE	$14,000									
114	334	Small Pick-up	1990	CHEV	$14,500									
214	28	Small Pick-up	1990	DODGE	$14,500									
214	36	Small Pick-up	1990	DODGE	$14,500									
120	5228	Hoist Truck	1985	CHEV	$61,500									
120	5236	Hoist Truck	1985	CHEV	$61,500									
420	2065	Hoist Truck	1982	INTERNATIONAL	$39,000									
124	3492	25 Yd Collectomatic	1983	CHEV	$82,000									
424	5098	25 Yd Collectomatic	1985	INTERNATIONAL	$85,500									
424	6047	25 Yd Collectomatic	1986	INTERNATIONAL	$93,000									
424	6054	25 Yd Collectomatic	1986	INTERNATIONAL	$93,000									
424	6278	25 Yd Collectomatic	1986	INTERNATIONAL	$93,000									
424	7037	25 Yd Collectomatic	1987	INTERNATIONAL	$111,500									
424	7094	25 Yd Collectomatic	1987	INTERNATIONAL	$111,500									
424	7102	25 Yd Collectomatic	1987	INTERNATIONAL	$111,500									
424	7110	25 Yd Collectomatic	1987	INTERNATIONAL	$111,500									

UNIT #		EQUIPMENT CLASS	MODEL	MANUFACTURER	ORIGINAL PURCHASE PRICE	ANNUAL USAGE (HOURS) 1983	1984	1985	1986	1987	1988	1989	1990	1991
424	7128	25 Yd Collectomatic	1987	INTERNATIONAL	$111,500									
424	7144	25 Yd Collectomatic	1987	INTERNATIONAL	$111,500									
424	5569	25 Yd Collectomatic	1985	INTERNATIONAL	$85,500									
424	8811	25 Yd Collectomatic	1988	INTERNATIONAL	$130,000									
424	8829	25 Yd Collectomatic	1988	INTERNATIONAL	$130,000									
426	1020	25 Yd Collectomatic	1991	INTERNATIONAL	$146,000									
426	1038	25 Yd Collectomatic	1991	INTERNATIONAL	$146,000									
426	1111	25 Yd Collectomatic	1991	INTERNATIONAL	$146,000									
125	3483	16 Yd collectomatic	1983	CHEV	$60,000									
425	2524	16 Yd collectomatic	1982	INTERNATIONAL	$56,000									
425	2532	16 Yd collectomatic	1982	INTERNATIONAL	$56,000									
425	5105	16 Yd collectomatic	1985	INTERNATIONAL	$63,000									
428	6290	Water Tanker	1986	INTERNATIONAL	$43,000									
237	8644	Compact Cars	1988	DODGE	$12,000									
137	5310	Compact Cars	1985	CHEV	$9,100									
237	1102	Compact Cars	1991	DODGE	$14,000									
237	5111	Compact Cars	1985	DODGE	$9,100									
237	5129	Compact Cars	1985	DODGE	$9,100									
237	5137	Compact Cars	1985	DODGE	$9,100									
237	5145	Compact Cars	1985	DODGE	$9,100									
237	7042	Compact Cars	1987	DODGE	$10,500									
237	8651	Compact Cars	1988	DODGE	$12,000									

UNIT #		EQUIPMENT CLASS	MODEL	MANUFACTURER	ORIGINAL PURCHASE PRICE	ANNUAL USAGE (HOURS) 1983	1984	1985	1986	1987	1988	1989	1990	1991
237	8669	Compact Cars	1988	DODGE	$12,000									
237	8677	Compact Cars	1988	DODGE	$12,000									
237	8685	Compact Cars	1988	DODGE	$12,000									
237	8701	Compact Cars	1988	DODGE	$12,000									
237	8719	Compact Cars	1988	DODGE	$12,000									
237	8727	Compact Cars	1988	DODGE	$12,000									
237	8735	Compact Cars	1988	DODGE	$12,000									
237	8743	Compact Cars	1988	DODGE	$12,000									
237	8750	Compact Cars	1988	DODGE	$12,000									
237	8768	Compact Cars	1988	DODGE	$12,000									
237	8776	Compact Cars	1988	DODGE	$12,000									
237	9147	Compact Cars	1989	DODGE	$12,500									
237	9154	Compact Cars	1989	DODGE	$12,500									
237	9164	Compact Cars	1989	DODGE	$12,500									
237	9170	Compact Cars	1989	DODGE	$12,500									
237	1102	Compact Cars	1991	DODGE	$14,000									
146	8651	Street Broom	1978	ELGIN	$87,000									
146	8586	Street Broom	1988	ELGIN	$137,000									
546	6305	Street Broom	1986	JOHNSTON	$125,000									
252	2134	Large Backhoe	1991	CATERPILLAR	$186,000									
354	7080	Small Backhoe	1987	CASE	$56,000									
354	8690	Small Backhoe	1988	CASE	$57,000									

UNIT #		EQUIPMENT CLASS	MODEL	MANUFACTURER	ORIGINAL PURCHASE PRICE	ANNUAL USAGE (HOURS) 1983	1984	1985	1986	1987	1988	1989	1990	1991
466	5709	Gang Mower	1965	JOHN DEERE	$20,000									
466	7275	Gang Mower	1977	JOHN DEERE	$26,000									
166	2048	Gang Mower	1982	JACOBSON	$18,000									
366	4026	Gang Mower	1984	CASE	$6,400									
366	4034	Gang Mower	1984	CASE	$6,400									
366	6138	Gang Mower	1986	CASE	$7,000									
366	6146	Gang Mower	1986	CASE	$7,000									
466	9099	Gang Mower	1979	JOHN DEERE	$17,000									
466	9107	Gang Mower	1979	JOHN DEERE	$17,000									
566	30	Gang Mower	1980	FORD	$17,500									
766	3048	Gang Mower	1983	YAZOO	$18,600									
766	3073	Gang Mower	1983	YAZOO	$18,600									
166	8805	Gang Mower	1988	JACOBSON	$28,000									
177	6897	Blower Attachment	1976	ROOTS	$50,000									
377	5863	Blower Attachment	1975	SMI	$50,000									
377	5889	Blower Attachment	1975	SMI	$50,000									
377	9188	Blower Attachment	1979	SMI	$60,000									
377	146	Blower Attachment	1980	SMI	$60,000									
277	5914	Blower Attachment	1965	SICARD	$25,000									
277	5922	Blower Attachment	1965	SICARD	$25,000									
277	5930	Blower Attachment	1965	SICARD	$25,000									
577	9329	Blower Attachment	1989	WILDCAT	$110,000									
577	9335	Blower Attachment	1989	WILDCAT	$110,000									
577	9343	Blower Attachment	1989	WILDCAT	$110,000									

UNIT #	EQUIPMENT CLASS		MODEL	MANUFACTURER	ORIGINAL PURCHASE PRICE	ANNUAL USAGE (HOURS) 1983	1984	1985	1986	1987	1988	1989	1990	1991
577	9350	Blower Attachment	1989	WILDCAT	$110,000									
202	2101	Loader/Snowblower – fixed	1962	SICARD	$30,000									
202	2119	Loader/Snowblower – fixed	1962	SICARD	$30,000									
218	5114	Compressor – Mounted	1985	DODGE	$16,000									
218	5122	Compressor – Mounted	1985	DODGE	$16,000									
218	1188	Compressor – Mounted	1991	DODGE	$25,000									
218	1196	Compressor – Mounted	1991	DODGE	$25,000									
650	9228	Small Sweeper	1989	POWER BOSS	$20,000									
257	4044	Large Roller	1974	GALION	$33,000									
307	2543	Small Dozer	1982	CASE	$27,000									
331	9084	Pothole Patcher	1989	FORD	$86,500									
431	3474	Pothole Patcher	1983	INTERNATIONAL	$71,350									
416	9025	5 Ton Dump Truck	1989	INTERNATIONAL	$91,000									
416	9033	5 Ton Dump Truck	1989	INTERNATIONAL	$91,000									
416	9041	5 Ton Dump Truck	1989	INTERNATIONAL	$91,000									
416	9058	5 Ton Dump Truck	1989	INTERNATIONAL	$91,000									
416	9066	5 Ton Dump Truck	1989	INTERNATIONAL	$91,000									
416	9074	5 Ton Dump Truck	1988	INTERNATIONAL	$91,000									

UNIT #		EQUIPMENT CLASS	MODEL	MANUFACTURER	ORIGINAL PURCHASE PRICE	ANNUAL USAGE (HOURS) 1983	1984	1985	1986	1987	1988	1989	1990	1991
416	2442	5 Ton Dump Truck	1982	INTERNATIONAL	$41,000									
416	3077	5 Ton Dump Truck	1983	INTERNATIONAL	$41,000									
416	5155	5 Ton Dump Truck	1985	INTERNATIONAL	$62,500									
416	5163	5 Ton Dump Truck	1985	INTERNATIONAL	$62,500									
416	5171	5 Ton Dump Truck	1985	INTERNATIONAL	$62,500									
416	6062	5 Ton Dump Truck	1986	INTERNATIONAL	$86,500									
416	6070	5 Ton Dump Truck	1986	INTERNATIONAL	$86,500									
416	6161	5 Ton Dump Truck	1986	INTERNATIONAL	$86,500									
416	6179	5 Ton Dump Truck	1986	INTERNATIONAL	$86,500									
416	6187	5 Ton Dump Truck	1986	INTERNATIONAL	$86,500									
416	6195	5 Ton Dump Truck	1986	INTERNATIONAL	$86,500									
416	6203	5 Ton Dump Truck	1986	INTERNATIONAL	$86,500									
416	6211	5 Ton Dump Truck	1986	INTERNATIONAL	$86,500									
416	6245	5 Ton Dump Truck	1986	INTERNATIONAL	$86,500									
416	6252	5 Ton Dump Truck	1986	INTERNATIONAL	$86,500									
416	7078	5 Ton Dump Truck	1987	INTERNATIONAL	$88,000									
416	1066	5 Ton Dump Truck	1991	INTERNATIONAL	$95,000									
416	1074	5 Ton Dump Truck	1991	INTERNATIONAL	$95,000									
416	1082	5 Ton Dump Truck	1991	INTERNATIONAL	$95,000									
416	1090	5 Ton Dump Truck	1991	INTERNATIONAL	$95,000									
417	7200	Tandem Dump Truck	1987	INTERNATIONAL	$116,500									
417	7218	Tandem Dump Truck	1987	INTERNATIONAL	$116,500									
417	8448	Tandem Dump Truck	1988	INTERNATIONAL	$120,000									

UNIT #		EQUIPMENT CLASS	MODEL	MANUFACTURER	ORIGINAL PURCHASE PRICE	ANNUAL USAGE (HOURS) 1983	1984	1985	1986	1987	1988	1989	1990	1991
422	7013	Sewer Jet	1987	INTERNATIONAL	$90,000									
501	7611	Grader	1987	CHAMPION	$100,000									
501	9286	Grader	1989	CHAMPION	$110,000									
501	6084	Grader	1986	CHAMPION	$100,000									
501	6092	Grader	1986	CHAMPION	$100,000									

APPENDIX H

FRAPOF OWNERSHIP MODULE

APPENDIX H OWNERSHIP COST MODULE PRESENT YEAR: 1991
LAST UPDATE: NOV.15/91

UNIT #	EQUIPMENT CLASS	MODEL	ORIGINAL PURCHASE PRICE	LIFE EXPECT	ANNUAL EQUIPMENT DEPRECIATION 1983	1984	1985	1986	1987	1988	1989	1990	1991	NEXT YEAR 1992	ANNUAL EQUIPMENT SALVAGE VALUE 1983	1984	1985	1986	1987	1988	1989	1990	1991	NEXT YEAR 1992
6 9013	Portable Compressor	1989	$15,000	7	0	0	0	0	0	0	2,143	2,143	2,143	2,143	0	0	0	0	0	0	15,000	12,857	10,714	8,571
6 9021	Portable Compressor	1989	$15,000	7	0	0	0	0	0	0	2,143	2,143	2,143	2,143	0	0	0	0	0	0	15,000	12,857	10,714	8,571
6 9039	Portable Compressor	1989	$15,000	7	0	0	0	0	0	0	2,143	2,143	2,143	2,143	0	0	0	0	0	0	15,000	12,857	10,714	8,571
6 1101	Portable Compressor	1981	$8,000	7	1,143	1,143	1,143	1,143	1,143	1,143	0	0	0	0	5,714	4,571	3,429	2,286	1,143	[illegible]	0	0	0	0
604 0109	Sidewalk Plows	1981	$35,000	6	5,833	5,833	5,833	5,833	5,833	0	0	0	0	0	23,333	17,500	11,667	5,833	0	0	0	0	0	0
604 0117	Sidewalk Plows	1981	$35,000	6	5,833	5,833	5,833	5,833	5,833	0	0	0	0	0	23,333	17,500	11,667	5,833	0	0	0	0	0	0
604 0125	Sidewalk Plows	1981	$35,000	6	5,833	5,833	5,833	5,833	5,833	0	0	0	0	0	23,333	17,500	11,667	5,833	0	0	0	0	0	0
604 9290	Sidewalk Plows	1989	$55,000	6	0	0	0	0	0	0	9,167	9,167	9,167	9,167	0	0	0	0	0	0	55,000	45,833	36,667	27,500
74 8194	Sidewalk Plows	1988	$52,000	6	0	0	0	0	0	8,667	8,667	8,667	8,667	8,667	0	0	0	0	0	0	52,000	43,333	34,667	26,000	17,333
74 8156	Sidewalk Plows	1986	$48,000	6	0	0	0	8,000	8,000	8,000	8,000	8,000	8,000	8,000	0	0	0	8,000	16,000	32,000	24,000	16,000	8,000	0
74 8222	Sidewalk Plows	1986	$48,000	6	0	0	0	8,000	8,000	8,000	8,000	8,000	8,000	8,000	0	0	0	8,000	16,000	32,000	24,000	16,000	8,000	0
74 7220	Sidewalk Plows	1987	$50,000	6	0	0	0	0	8,333	8,333	8,333	8,333	8,333	8,333	0	0	0	0	8,333	41,667	33,333	25,000	16,667	8,333
74 8232	Sidewalk Plows	1988	$52,000	6	0	0	0	0	0	8,667	8,667	8,667	8,667	8,667	0	0	0	0	0	52,000	43,333	34,667	26,000	17,333
74 9184	Sidewalk Plows	1989	$55,000	6	0	0	0	0	0	0	9,167	9,167	9,167	9,167	0	0	0	0	0	0	55,000	45,833	36,667	27,500
74 9198	Sidewalk Plows	1989	$55,000	6	0	0	0	0	0	0	9,167	9,167	9,167	9,167	0	0	0	0	0	0	55,000	45,833	36,667	27,500
102 7526	Loader	1987	$110,000	12	0	0	0	0	9,833	9,833	9,833	9,833	9,833	9,833	0	0	0	0	110,000	100,167	90,333	80,500	70,667	60,833
302 3512	Loader	1972	$50,000	12	4,250	4,250	4,250	0	0	0	0	0	0	0	8,500	4,250	0	0	0	0	0	0	0	0
102 7606	Loader	1987	$110,000	12	0	0	0	0	9,833	9,833	9,833	9,833	9,833	9,833	0	0	0	0	110,000	100,167	90,333	80,500	70,667	60,833
302 5608	Loader	1975	$55,000	12	4,583	4,583	4,583	4,583	4,583	0	0	0	0	0	18,333	13,750	9,167	4,583	0	0	0	0	0	0
402 9359	Loader	1989	$110,000	12	0	0	0	0	0	0	9,167	9,167	9,167	9,167	0	0	0	0	0	0	110,000	100,833	91,667	82,500
402 9377	Loader	1989	$110,000	12	0	0	0	0	0	0	9,167	9,167	9,167	9,167	0	0	0	0	0	0	110,000	100,833	91,667	82,500
102 6012	Loader	1986	$117,000	12	0	0	0	9,750	9,750	9,750	9,750	9,750	9,750	9,750	0	0	0	117,000	107,250	97,500	87,750	78,000	68,250	58,500
102 6020	Loader	1986	$117,000	12	0	0	0	9,750	9,750	9,750	9,750	9,750	9,750	9,750	0	0	0	117,000	107,250	97,500	87,750	78,000	68,250	58,500
202 2127	Loader	1981	$85,000	12	7,083	7,083	7,083	7,083	7,083	7,083	7,083	7,083	7,083	7,083	70,833	63,750	56,667	49,583	42,500	35,417	28,333	21,250	14,167	7,083
202 9163	Loader	1979	$73,000	12	6,083	6,083	6,083	6,083	6,083	6,083	6,083	6,083	6,083	0	48,667	42,583	36,500	30,417	24,333	18,250	12,167	6,083	0	0
302 161	Loader	1980	$79,000	12	6,583	6,583	6,583	6,583	6,583	6,583	6,583	6,583	6,583	6,583	59,250	52,667	46,083	39,500	32,917	26,333	19,750	13,167	6,583	0
302 5012	Loader	1985	$85,000	12	0	0	7,083	7,083	7,083	7,083	7,083	7,083	7,083	7,083	0	0	85,000	77,917	70,833	63,750	56,667	49,583	42,500	35,417
302 5020	Loader	1985	$85,000	12	0	0	7,083	7,083	7,083	7,083	7,083	7,083	7,083	7,083	0	0	85,000	77,917	70,833	63,750	56,667	49,583	42,500	35,417
402 0442	Loader	1990	$160,000	12	0	0	0	0	0	0	0	13,333	13,333	13,333	0	0	0	0	0	0	0	160,000	146,667	133,333
402 0434	Loader	1990	$160,000	12	0	0	0	0	0	0	0	13,333	13,333	13,333	0	0	0	0	0	0	0	160,000	146,667	133,333

UNIT #	EQUIPMENT CLASS	MODEL	ORIGINAL PURCHASE PRICE	LIFE EXPECT	ANNUAL EQUIPMENT DEPRECIATION 1983	1984	1985	1986	1987	1988	1989	1990	1991	NEXT YEAR 1992	ANNUAL EQUIPMENT SALVAGE VALUE 1983	1984	1985	1986	1987	1988	1989	1990	1991	NEXT YEAR 1992
402 0458	Loader	1990	$160,000	12	0	0	0	0	0	0	0	13,333	13,333	13,333	0	0	0	0	0	0	0	160,000	146,667	133,333
110 9206	1/2 Ton Pickup	1989	$13,800	4	0	0	0	0	0	0	3,450	3,450	3,450	3,450	0	0	0	0	0	0	13,800	10,350	6,900	3,450
110 9214	1/2 Ton Pickup	1989	$13,800	4	0	0	0	0	0	0	3,450	3,450	3,450	3,450	0	0	0	0	0	0	13,800	10,350	6,900	3,450
110 9222	1/2 Ton Pickup	1989	$13,800	4	0	0	0	0	0	0	3,450	3,450	3,450	3,450	0	0	0	0	0	0	13,800	10,350	6,900	3,450
110 9230	1/2 Ton Pickup	1989	$13,800	4	0	0	0	0	0	0	3,450	3,450	3,450	3,450	0	0	0	0	0	0	13,800	10,350	6,900	3,450
110 9248	1/2 Ton Pickup	1989	$13,800	4	0	0	0	0	0	0	3,450	3,450	3,450	3,450	0	0	0	0	0	0	13,800	10,350	6,900	3,450
110 3395	1/2 Ton Pickup	1983	$9,000	4	2,250	2,250	2,250	2,250	2,250	0	0	0	0	0	9,000	6,750	4,500	2,250	0	0	0	0	0	0
110 9255	1/2 Ton Pickup	1989	$13,800	4	0	0	0	0	0	0	3,450	3,450	3,450	3,450	0	0	0	0	0	0	13,800	10,350	6,900	3,450
110 9263	1/2 Ton Pickup	1989	$13,800	4	0	0	0	0	0	0	3,450	3,450	3,450	3,450	0	0	0	0	0	0	13,800	10,350	6,900	3,450
110 9271	1/2 Ton Pickup	1989	$13,800	4	0	0	0	0	0	0	3,450	3,450	3,450	3,450	0	0	0	0	0	0	13,800	10,350	6,900	3,450
110 5030	1/2 Ton Pickup	1985	$9,500	4	0	0	2,375	2,375	2,375	2,375	2,375	0	0	0	0	0	9,500	7,125	4,750	2,375	0	0	0	0
110 5261	1/2 Ton Pickup	1985	$9,500	4	0	0	2,375	2,375	2,375	2,375	2,375	0	0	0	0	0	9,500	7,125	4,750	2,375	0	0	0	0
110 6152	1/2 Ton Pickup	1986	$10,000	4	0	0	0	2,500	2,500	2,500	2,500	2,500	0	0	0	0	0	0	10,000	7,500	5,000	2,500	0	0
110 6244	1/2 Ton Pickup	1986	$10,000	4	0	0	0	2,500	2,500	2,500	2,500	2,500	0	0	0	0	0	0	10,000	7,500	5,000	2,500	0	0
110 6335	1/2 Ton Pickup	1986	$10,000	4	0	0	0	2,500	2,500	2,500	2,500	2,500	0	0	0	0	0	0	10,000	7,500	5,000	2,500	0	0
210 8389	1/2 Ton Pickup	1988	$14,200	4	0	0	0	0	0	3,550	3,550	3,550	3,550	3,550	0	0	0	0	0	14,200	10,650	7,100	3,550	0
210 8397	1/2 Ton Pickup	1988	$14,200	4	0	0	0	0	0	3,550	3,550	3,550	3,550	3,550	0	0	0	0	0	14,200	10,650	7,100	3,550	0
210 8403	1/2 Ton Pickup	1988	$14,200	4	0	0	0	0	0	3,550	3,550	3,550	3,550	3,550	0	0	0	0	0	14,200	10,650	7,100	3,550	0
210 8413	1/2 Ton Pickup	1988	$14,200	4	0	0	0	0	0	3,550	3,550	3,550	3,550	3,550	0	0	0	0	0	14,200	10,650	7,100	3,550	0
210 8421	1/2 Ton Pickup	1988	$14,200	4	0	0	0	0	0	3,550	3,550	3,550	3,550	3,550	0	0	0	0	0	14,200	10,650	7,100	3,550	0
210 8439	1/2 Ton Pickup	1988	$14,200	4	0	0	0	0	0	3,550	3,550	3,550	3,550	3,550	0	0	0	0	0	14,200	10,650	7,100	3,550	0
210 6201	1/2 Ton Pickup	1986	$10,000	4	0	0	0	2,500	2,500	2,500	2,500	2,500	0	0	0	0	0	0	10,000	7,500	5,000	2,500	0	0
210 6219	1/2 Ton Pickup	1986	$10,000	4	0	0	0	2,500	2,500	2,500	2,500	2,500	0	0	0	0	0	0	10,000	7,500	5,000	2,500	0	0
210 6227	1/2 Ton Pickup	1986	$10,000	4	0	0	0	2,500	2,500	2,500	2,500	2,500	0	0	0	0	0	0	10,000	7,500	5,000	2,500	0	0
210 6235	1/2 Ton Pickup	1986	$13,200	4	0	0	0	3,300	3,300	3,300	3,300	3,300	0	0	0	0	0	0	13,200	9,900	6,600	3,300	0	0
210 7050	1/2 Ton Pickup	1987	$13,200	4	0	0	0	0	3,300	3,300	3,300	3,300	3,300	0	0	0	0	0	0	13,200	9,900	6,600	3,300	0	0
210 7068	1/2 Ton Pickup	1987	$13,200	4	0	0	0	0	3,300	3,300	3,300	3,300	3,300	0	0	0	0	0	0	13,200	9,900	6,600	3,300	0	0
210 7092	1/2 Ton Pickup	1987	$13,200	4	0	0	0	0	3,300	3,300	3,300	3,300	3,300	0	0	0	0	0	0	13,200	9,900	6,600	3,300	0	0
210 7100	1/2 Ton Pickup	1987	$13,200	4	0	0	0	0	3,300	3,300	3,300	3,300	3,300	0	0	0	0	0	0	13,200	9,900	6,600	3,300	0	0
210 7118	1/2 Ton Pickup	1987	$13,200	4	0	0	0	0	3,300	3,300	3,300	3,300	3,300	0	0	0	0	0	0	13,200	9,900	6,600	3,300	0	0
210 7126	1/2 Ton Pickup	1987	$13,200	4	0	0	0	0	3,300	3,300	3,300	3,300	3,300	0	0	0	0	0	0	13,200	9,900	6,600	3,300	0	0
210 7134	1/2 Ton Pickup	1987	$13,200	4	0	0	0	0	3,300	3,300	3,300	3,300	3,300	0	0	0	0	0	0	13,200	9,900	6,600	3,300	0	0
210 7142	1/2 Ton Pickup	1987	$13,200	4	0	0	0	0	3,300	3,300	3,300	3,300	3,300	0	0	0	0	0	0	13,200	9,900	6,600	3,300	0	0
210 7159	1/2 Ton Pickup	1987	$13,200	4	0	0	0	0	3,300	3,300	3,300	3,300	3,300	0	0	0	0	0	0	13,200	9,900	6,600	3,300	0	0
210 7167	1/2 Ton Pickup	1987	$13,200	4	0	0	0	0	3,300	3,300	3,300	3,300	3,300	0	0	0	0	0	0	13,200	9,900	6,600	3,300	0	0

UNIT #	EQUIPMENT CLASS	MODEL	ORIGINAL PURCHASE PRICE	LIFE EXPECT	ANNUAL EQUIPMENT DEPRECIATION 1983	1984	1985	1986	1987	1988	198	1990	1991	NEXT YEAR 1992	ANNUAL EQUIPMENT SALVAGE VALUE 1983	1984	1985	1986	1987	1988	1989	1990	1991	NEXT YEAR 1992
210 7175	1/2 Ton Pickup	1987	$13,200	4	0	0	0	0	3,300	3,300	3,30	3,300	3,300	0	0	0	0	0	13,200	9,900	6,600	3,300	0	0
210 7183	1/2 Ton Pickup	1987	$13,200	4	0	0	0	0	3,300	3,300	3,30	3,300	3,300	0	0	0	0	0	13,200	9,900	6,600	3,300	0	0
110 9099	1/2 Ton Pickup	1989	$13,500	4	0	0	0	0	0	0	3,45	3,450	3,450	3,450	0	0	0	0	0	0	13,800	10,350	6,900	3,450
210 138	1/2 Ton Pickup	1990	$14,000	4	0	0	0	0	0	0	0	3,500	3,500	3,500	0	0	0	0	0	0	0	14,000	10,500	7,000
210 147	1/2 Ton Pickup	1990	$14,000	4	0	0	0	0	0	0	0	3,500	3,500	3,500	0	0	0	0	0	0	0	14,000	10,500	7,000
210 155	1/2 Ton Pickup	1990	$14,000	4	0	0	0	0	0	0	0	3,500	3,500	3,500	0	0	0	0	0	0	0	14,000	10,500	7,000
210 238	1/2 Ton Pickup	1990	$14,000	4	0	0	0	0	0	0	0	3,500	3,500	3,500	0	0	0	0	0	0	0	14,000	10,500	7,000
210 0246	1/2 Ton Pickup	1990	$14,000	4	0	0	0	0	0	0	0	3,500	3,500	3,500	0	0	0	0	0	0	0	14,000	10,500	7,000
210 0253	1/2 Ton Pickup	1990	$14,000	4	0	0	0	0	0	0	0	3,500	3,500	3,500	0	0	0	0	0	0	0	14,000	10,500	7,000
210 0261	1/2 Ton Pickup	1990	$14,000	4	0	0	0	0	0	0	0	3,500	3,500	3,500	0	0	0	0	0	0	0	14,000	10,500	7,000
210 0279	1/2 Ton Pickup	1990	$14,000	4	0	0	0	0	0	0	0	3,500	3,500	3,500	0	0	0	0	0	0	0	14,000	10,500	7,000
210 1152	1/2 Ton Pickup	1991	$14,400	4	0	0	0	0	0	0	0	0	3,600	3,600	0	0	0	0	0	0	0	0	14,400	10,800
111 8512	One Ton Truck	1988	$14,800	4	0	0	0	0	0	3,700	3,700	3,700	3,700	3,700	0	0	0	0	0	14,800	11,100	7,400	3,700	0
111 8538	One Ton Truck	1988	$14,800	4	0	0	0	0	0	3,700	3,700	3,700	3,700	3,700	0	0	0	0	0	14,800	11,100	7,400	3,700	0
111 5286	One Ton Truck	1985	$13,200	4	0	0	3,300	3,300	3,300	3,300	3,30	0	0	0	0	0	13,200	9,900	6,600	3,300	0	0	0	0
111 5294	One Ton Truck	1985	$13,200	4	0	0	3,300	3,300	3,300	3,300	3,30	0	0	0	0	0	13,200	9,900	6,600	3,300	0	0	0	0
111 6342	One Ton Truck	1986	$12,500	4	0	0	0	3,125	3,125	3,125	3,12	3,125	0	0	0	0	0	12,500	9,375	6,250	3,125	0	0	0
111 6359	One Ton Truck	1986	$12,500	4	0	0	0	3,125	3,125	3,125	3,12	3,125	0	0	0	0	0	12,500	9,375	6,250	3,125	0	0	0
111 6367	One Ton Truck	1986	$12,500	4	0	0	0	3,125	3,125	3,125	3,12	3,125	0	0	0	0	0	12,500	9,375	6,250	3,125	0	0	0
211 6259	One Ton Truck	1986	$12,500	4	0	0	0	3,125	3,125	3,125	3,12	3,125	0	0	0	0	0	12,500	9,375	6,250	3,125	0	0	0
211 7018	One Ton Truck	1987	$13,300	4	0	0	0	0	3,325	3,325	3,32	3,325	3,325	0	0	0	0	0	13,300	9,975	6,650	3,325	0	0
211 7026	One Ton Truck	1987	$13,300	4	0	0	0	0	3,325	3,325	3,32	3,325	3,325	0	0	0	0	0	13,300	9,975	6,650	3,325	0	0
211 8487	One Ton Truck	1988	$14,800	4	0	0	0	0	0	3,700	3,700	3,700	3,700	3,700	0	0	0	0	0	14,800	11,100	7,400	3,700	0
211 8503	One Ton Truck	1988	$14,800	4	0	0	0	0	0	3,700	3,700	3,700	3,700	3,700	0	0	0	0	0	14,800	11,100	7,400	3,700	0
211 9300	One Ton Truck	1989	$16,000	4	0	0	0	0	0	0	4,00	4,000	4,000	4,000	0	0	0	0	0	0	16,000	12,000	8,000	4,000
211 8495	One Ton Truck	1988	$14,800	4	0	0	0	0	0	3,700	3,70	3,700	3,700	3,700	0	0	0	0	0	14,800	11,100	7,400	3,700	0
211 7190	One Ton Truck	1987	$13,300	4	0	0	0	0	3,325	3,325	3,325	3,325	3,325	0	0	0	0	0	13,300	9,975	6,650	3,325	0	0
211 13	One Ton Truck	1990	$18,000	4	0	0	0	0	0	0	0	4,500	4,500	4,500	0	0	0	0	0	0	0	18,000	13,500	9,000
211 54	One Ton Truck	1990	$18,000	4	0	0	0	0	0	0	0	4,500	4,500	4,500	0	0	0	0	0	0	0	18,000	13,500	9,000
211 302	One Ton Truck	1990	$18,000	4	0	0	0	0	0	0	0	4,500	4,500	4,500	0	0	0	0	0	0	0	18,000	13,500	9,000
311 9212	One Ton Truck	1989	$16,000	4	0	0	0	0	0	0	4,00	4,000	4,000	4,000	0	0	0	0	0	0	16,000	12,000	8,000	4,000
311 1168	One Ton Truck	1991	$20,400	4	0	0	0	0	0	0	0	0	5,100	5,100	0	0	0	0	0	0	0	0	20,400	15,300
111 8520	One Ton Truck	1988	$14,800	4	0	0	0	0	0	3,700	3,700	3,700	3,700	3,700	0	0	0	0	0	14,800	11,100	7,400	3,700	0
211 1177	Utility Truck	1991	$20,400	2	0	0	0	0	0	0	0	0	10,200	10,200	0	0	0	0	0	0	0	0	20,400	10,200

UNIT #	EQUIPMENT CLASS	MODEL	ORIGINAL PURCHASE PRICE	LIFE EXPECT	ANNUAL EQUIPMENT DEPRECIATION 1983	1984	1985	1986	1987	1988	1989	1990	1991	NEXT YEAR 1992	ANNUAL EQUIPMENT SALVAGE VALUE 1983	1984	1985	1986	1987	1988	1989	1990	1991	NEXT YEAR 1992
113 8783	VAN	1988	$14,000	4	0	0	0	0	0	3,500	3,500	3,500	3,500	3,500	0	0	0	0	0	14,000	10,500	7,000	3,500	0
112 5244	VAN	1985	$12,400	4	0	0	3,100	3,100	3,100	3,100	3,100	0	0	0	0	0	12,400	9,300	6,200	3,100	0	0	0	0
212 8167	VAN	1986	$13,700	4	0	0	0	3,425	3,425	3,425	3,425	3,425	0	0	0	0	0	13,700	10,275	6,850	3,425	0	0	0
212 8175	VAN	1986	$13,700	4	0	0	0	3,425	3,425	3,425	3,425	3,425	0	0	0	0	0	13,700	10,275	6,850	3,425	0	0	0
212 8222	VAN	1986	$13,700	4	0	0	0	3,425	3,425	3,425	3,425	3,425	0	0	0	0	0	13,700	10,275	6,850	3,425	0	0	0
212 8577	VAN	1988	$14,000	4	0	0	0	0	0	3,500	3,500	3,500	3,500	3,500	0	0	0	0	0	14,000	10,500	7,000	3,500	0
312 8543	VAN	1988	$14,000	4	0	0	0	0	0	3,500	3,500	3,500	3,500	3,500	0	0	0	0	0	14,000	10,500	7,000	3,500	0
112 96	VAN	1990	$15,500	4	0	0	0	0	0	0	0	3,875	3,875	3,875	0	0	0	0	0	0	0	15,500	11,625	7,750
112 104	VAN	1990	$15,500	4	0	0	0	0	0	0	0	3,875	3,875	3,875	0	0	0	0	0	0	0	15,500	11,625	7,750
112 0112	VAN	1990	$15,500	4	0	0	0	0	0	0	0	3,875	3,875	3,875	0	0	0	0	0	0	0	15,500	11,625	7,750
212 0046	VAN	1990	$15,500	4	0	0	0	0	0	0	0	3,875	3,875	3,875	0	0	0	0	0	0	0	15,500	11,625	7,750
212 0061	VAN	1990	$15,500	4	0	0	0	0	0	0	0	3,875	3,875	3,875	0	0	0	0	0	0	0	15,500	11,625	7,750
212 0079	VAN	1990	$15,500	4	0	0	0	0	0	0	0	3,875	3,875	3,875	0	0	0	0	0	0	0	15,500	11,625	7,750
212 0087	VAN	1990	$15,500	4	0	0	0	0	0	0	0	3,875	3,875	3,875	0	0	0	0	0	0	0	15,500	11,625	7,750
212 0285	VAN	1990	$15,500	4	0	0	0	0	0	0	0	3,875	3,875	3,875	0	0	0	0	0	0	0	15,500	11,625	7,750
212 0290	VAN	1990	$15,500	4	0	0	0	0	0	0	0	3,875	3,875	3,875	0	0	0	0	0	0	0	15,500	11,625	7,750
312 1209	VAN	1991	$17,500	4	0	0	0	0	0	0	0	0	4,375	4,375	0	0	0	0	0	0	0	0	17,500	13,125
312 1217	VAN	1991	$17,500	4	0	0	0	0	0	0	0	0	4,375	4,375	0	0	0	0	0	0	0	0	17,500	13,125
312 1365	VAN	1991	$17,500	4	0	0	0	0	0	0	0	0	4,375	4,375	0	0	0	0	0	0	0	0	17,500	13,125
114 5085	Small Pick-up	1985	$10,000	4	0	0	2,500	2,500	2,500	2,500	2,500	0	0	0	0	0	10,000	7,500	5,000	2,500	0	0	0	0
114 8154	Small Pick-up	1988	$14,000	4	0	0	0	0	0	3,500	3,500	3,500	3,500	3,500	0	0	0	0	0	14,000	10,500	7,000	3,500	0
114 8379	Small Pick-up	1988	$14,000	4	0	0	0	0	0	3,500	3,500	3,500	3,500	3,500	0	0	0	0	0	14,000	10,500	7,000	3,500	0
214 9833	Small Pick-up	1989	$14,000	4	0	0	0	0	0	0	3,500	3,500	3,500	3,500	0	0	0	0	0	0	14,000	10,500	7,000	3,500
114 334	Small Pick-up	1990	$14,500	4	0	0	0	0	0	0	0	3,625	3,625	3,625	0	0	0	0	0	0	0	14,500	10,875	7,250
214 28	Small Pick-up	1990	$14,500	4	0	0	0	0	0	0	0	3,625	3,625	3,625	0	0	0	0	0	0	0	14,500	10,875	7,250
214 38	Small Pick-up	1990	$14,500	4	0	0	0	0	0	0	0	3,625	3,625	3,625	0	0	0	0	0	0	0	14,500	10,875	7,250
120 5228	Hoist Truck	1985	$81,500	8	0	0	7,688	7,688	7,688	7,688	7,688	7,688	7,688	7,688	0	0	61,500	53,813	46,125	38,438	30,750	23,063	15,375	7,688
120 5236	Hoist Truck	1985	$81,500	8	0	0	7,688	7,688	7,688	7,688	7,688	7,688	7,688	7,688	0	0	61,500	53,813	46,125	38,438	30,750	23,063	15,375	7,688
420 2065	Hoist Truck	1982	$39,000	8	4,875	4,875	4,875	4,875	4,875	4,875	4,875	4,875	0	0	34,125	29,250	24,375	19,500	14,625	9,750	4,875	0	0	0
124 3492	25 Yd Collectomatic	1983	$82,000	8	10,250	10,250	10,250	10,250	10,250	10,250	10,250	10,250	10,250	0	82,000	71,750	61,500	51,250	41,000	30,750	20,500	10,250	0	0
424 5058	25 Yd Collectomatic	1985	$85,500	8	0	0	10,688	10,688	10,688	10,688	10,688	10,688	10,688	10,688	0	0	85,500	74,813	64,125	53,438	42,750	32,063	21,375	10,688
424 6047	25 Yd Collectomatic	1986	$93,000	8	0	0	0	11,625	11,625	11,625	11,625	11,625	11,625	11,625	0	0	0	93,000	81,375	69,750	58,125	46,500	34,875	23,250
424 6054	25 Yd Collectomatic	1986	$93,000	8	0	0	0	11,625	11,625	11,625	11,625	11,625	11,625	11,625	0	0	0	93,000	81,375	69,750	58,125	46,500	34,875	23,250

UNIT #	EQUIPMENT CLASS	MODEL	ORIGINAL PURCHASE PRICE	LIFE EXPECT	ANNUAL EQUIPMENT DEPRECIATION 1983	1984	1985	1986	1987	1988	1989	1990	1991	NEXT YEAR 1992	ANNUAL EQUIPMENT SALVAGE VALUE 1983	1984	1985	1986	1987	1988	1989	1990	1991	NEXT YEAR 1992
424 6278	25 Yd Collectomatic	1986	$93,000	8	0	0	0	11,625	11,625	11,625	11,625	11,625	11,625	11,625	0	0	0	93,000	81,375	69,750	58,125	46,500	34,875	23,250
424 7037	25 Yd Collectomatic	1987	$111,500	8	0	0	0	0	13,938	13,938	13,938	13,938	13,938	13,938	0	0	0	0	111,500	97,563	83,625	69,688	55,750	41,813
424 7094	25 Yd Collectomatic	1987	$111,500	8	0	0	0	0	13,938	13,938	13,938	13,938	13,938	13,938	0	0	0	0	111,500	97,563	83,625	69,688	55,750	41,813
424 7102	25 Yd Collectomatic	1987	$111,500	8	0	0	0	0	13,938	13,938	13,938	13,938	13,938	13,938	0	0	0	0	111,500	97,563	83,625	69,688	55,750	41,813
424 7110	25 Yd Collectomatic	1987	$111,500	8	0	0	0	0	13,938	13,938	13,938	13,938	13,938	13,938	0	0	0	0	111,500	97,563	83,625	69,688	55,750	41,813
424 7128	25 Yd Collectomatic	1987	$111,500	8	0	0	0	0	13,938	13,938	13,938	13,938	13,938	13,938	0	0	0	0	111,500	97,563	83,625	69,688	55,750	41,813
424 7144	25 Yd Collectomatic	1987	$111,500	8	0	0	0	0	13,938	13,938	13,938	13,938	13,938	13,938	0	0	0	0	111,500	97,563	83,625	69,688	55,750	41,813
424 5569	25 Yd Collectomatic	1985	$85,500	8	0	0	10,688	10,688	10,688	10,688	10,688	10,688	10,688	10,688	0	0	85,500	74,813	64,125	53,438	42,750	32,063	21,375	10,688
424 8811	25 Yd Collectomatic	1988	$130,000	8	0	0	0	0	0	16,250	16,250	16,250	16,250	16,250	0	0	0	0	0	130,000	113,750	97,500	81,250	65,000
424 8829	25 Yd Collectomatic	1988	$130,000	8	0	0	0	0	0	16,250	16,250	16,250	16,250	16,250	0	0	0	0	0	130,000	113,750	97,500	81,250	65,000
426 1020	25 Yd Collectomatic	1991	$146,000	8	0	0	0	0	0	0	0	0	18,250	18,250	0	0	0	0	0	0	0	0	146,000	127,750
426 1038	25 Yd Collectomatic	1991	$146,000	8	0	0	0	0	0	0	0	0	18,250	18,250	0	0	0	0	0	0	0	0	146,000	127,750
426 1111	25 Yd Collectomatic	1991	$146,000	8	0	0	0	0	0	0	0	0	18,250	18,250	0	0	0	0	0	0	0	0	146,000	127,750
125 3483	16 Yd collectomatic	1983	$60,000	8	7,500	7,500	7,500	7,500	7,500	7,500	7,500	7,500	7,500	0	60,000	52,500	45,000	37,500	30,000	22,500	15,000	7,500	0	0
425 2524	16 Yd collectomatic	1982	$56,000	8	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	0	0	49,000	42,000	35,000	28,000	21,000	14,000	7,000	0	0	0
425 2532	16 Yd collectomatic	1982	$56,000	8	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	0	0	49,000	42,000	35,000	28,000	21,000	14,000	7,000	0	0	0
425 5105	16 Yd collectomatic	1985	$63,000	8	0	0	7,875	7,875	7,875	7,875	7,875	7,875	7,875	7,875	0	0	63,000	55,125	47,250	39,375	31,500	23,625	15,750	7,875
428 8290	Water Tanker	1986	$43,000	6	0	0	0	7,167	7,167	7,167	7,167	7,167	7,167	7,167	0	0	0	43,000	35,833	28,667	21,500	14,333	7,167	(0)
237 3644	Compact Cars	1986	$12,000	5	0	0	0	0	0	2,400	2,400	2,400	2,400	2,400	0	0	0	0	0	12,000	9,600	7,200	4,800	2,400
137 5310	Compact Cars	1985	$9,100	5	0	0	1,820	1,820	1,820	1,820	1,820	1,820	0	0	0	0	9,100	7,280	5,460	3,640	1,820	0	0	0
237 111	Compact Cars	1991	$14,000	5	0	0	0	0	0	0	0	0	2,800	2,800	0	0	0	0	0	0	0	0	14,000	11,200
237 51..	Compact Cars	1985	$9,100	5	0	0	1,820	1,820	1,820	1,820	1,820	1,820	0	0	0	0	9,100	7,280	5,460	3,640	1,820	0	0	0
237 5129	Compact Cars	1985	$9,100	5	0	0	1,820	1,820	1,820	1,820	1,820	1,820	0	0	0	0	9,100	7,280	5,460	3,640	1,820	0	0	0
237 5137	Compact Cars	1985	$9,100	5	0	0	1,820	1,820	1,820	1,820	1,820	1,820	0	0	0	0	9,100	7,280	5,460	3,640	1,820	0	0	0
237 5145	Compact Cars	1985	$9,100	5	0	0	1,820	1,820	1,820	1,820	1,820	1,820	0	0	0	0	9,100	7,280	5,460	3,640	1,820	0	0	0
237 7042	Compact Cars	1987	$10,500	5	0	0	0	0	2,100	2,100	2,100	2,100	2,100	2,100	0	0	0	0	10,500	8,400	6,300	4,200	2,100	0
237 8651	Compact Cars	1988	$12,000	5	0	0	0	0	0	2,400	2,400	2,400	2,400	2,400	0	0	0	0	0	12,000	9,600	7,200	4,800	2,400
237 8669	Compact Cars	1988	$12,000	5	0	0	0	0	0	2,400	2,400	2,400	2,400	2,400	0	0	0	0	0	12,000	9,600	7,200	4,800	2,400
237 8677	Compact Cars	1988	$12,000	5	0	0	0	0	0	2,400	2,400	2,400	2,400	2,400	0	0	0	0	0	12,000	9,600	7,200	4,800	2,400
237 8685	Compact Cars	1988	$12,000	5	0	0	0	0	0	2,400	2,400	2,400	2,400	2,400	0	0	0	0	0	12,000	9,600	7,200	4,800	2,400
237 8701	Compact Cars	1988	$12,000	5	0	0	0	0	0	2,400	2,400	2,400	2,400	2,400	0	0	0	0	0	12,000	9,600	7,200	4,800	2,400
237 8719	Compact Cars	1988	$12,000	5	0	0	0	0	0	2,400	2,400	2,400	2,400	2,400	0	0	0	0	0	12,000	9,600	7,200	4,800	2,400
237 8727	Compact Cars	1988	$12,000	5	0	0	0	0	0	2,400	2,400	2,400	2,400	2,400	0	0	0	0	0	12,000	9,600	7,200	4,800	2,400

UNIT #	EQUIPMENT CLASS	MODEL	ORIGINAL PURCHASE PRICE	LIFE EXPECT	ANNUAL EQUIPMENT DEPRECIATION 1983	1984	1985	1986	1987	1988	1989	1990	1991	NEXT YEAR 1992	ANNUAL EQUIPMENT SALVAGE VALUE 1983	1984	1985	1986	1987	1988	1989	1990	1991	NEXT YEAR 1992
237 6735	Compact Cars	1988	$12,000	5	0	0	0	0	0	2,400	2,400	2,400	2,400	2,400	0	0	0	0	0	12,000	9,600	7,200	4,800	2,400
237 6743	Compact Cars	1988	$12,000	5	0	0	0	0	0	2,400	2,400	2,400	2,400	2,400	0	0	0	0	0	12,000	9,600	7,200	4,800	2,400
237 6750	Compact Cars	1988	$12,000	5	0	0	0	0	0	2,400	2,400	2,400	2,400	2,400	0	0	0	0	0	12,000	9,600	7,200	4,800	2,400
237 6768	Compact Cars	1988	$12,000	5	0	0	0	0	0	2,400	2,400	2,400	2,400	2,400	0	0	0	0	0	12,000	9,600	7,200	4,800	2,400
237 6776	Compact Cars	1988	$12,000	5	0	0	0	0	0	2,400	2,400	2,400	2,400	2,400	0	0	0	0	0	12,000	9,600	7,200	4,800	2,400
237 9147	Compact Cars	1989	$12,500	5	0	0	0	0	0	0	2,500	2,500	2,500	2,500	0	0	0	0	0	0	12,500	10,000	7,500	5,000
237 9154	Compact Cars	1989	$12,500	5	0	0	0	0	0	0	2,500	2,500	2,500	2,500	0	0	0	0	0	0	12,500	10,000	7,500	5,000
237 9162	Compact Cars	1989	$12,500	5	0	0	0	0	0	0	2,500	2,500	2,500	2,500	0	0	0	0	0	0	12,500	10,000	7,500	5,000
237 9170	Compact Cars	1989	$12,500	5	0	0	0	0	0	0	2,500	2,500	2,500	2,500	0	0	0	0	0	0	12,500	10,000	7,500	5,000
237 1102	Compact Cars	1991	$14,000	5	0	0	0	0	0	0	0	0	2,800	2,800	0	0	0	0	0	0	0	0	14,000	11,200
146 6651	Street Broom	1978	$67,000	6	10,875	10,875	10,875	10,875	0	0	0	0	0	0	32,625	21,750	10,875	0	0	0	0	0	0	0
146 6586	Street Broom	1986	$137,000	6	0	0	0	0	0	17,125	17,125	17,125	17,125	17,125	0	0	0	0	0	137,000	119,875	102,750	85,625	68,500
546 6305	Street Broom	1986	$125,000	6	0	0	0	15,625	15,625	15,625	15,625	15,625	15,625	15,625	0	0	0	125,000	109,375	93,750	78,125	62,500	46,875	31,250
252 2134	Large Backhoe	1991	$186,000	12	0	0	0	0	0	0	0	0	15,500	15,500	0	0	0	0	0	0	0	0	186,000	170,500
354 7080	Small Backhoe	1987	$56,000	6	0	0	0	0	9,333	9,333	9,333	9,333	9,333	9,333	0	0	0	0	56,000	46,667	37,333	28,000	18,667	9,333
354 6690	Small Backhoe	1988	$57,000	6	0	0	0	0	0	9,500	9,500	9,500	9,500	9,500	0	0	0	0	0	57,000	47,500	38,000	28,500	19,000
466 5709	Gang Mower	1965	$20,000	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
466 7275	Gang Mower	1977	$26,000	8	3,250	3,250	3,250	0	0	0	0	0	0	0	6,500	3,250	0	0	0	0	0	0	0	0
186 2046	Gang Mower	1982	$18,000	8	2,250	2,250	2,250	2,250	2,250	2,250	2,250	2,250	0	0	15,750	13,500	11,250	9,000	6,750	4,500	2,250	0	0	0
366 4026	Gang Mower	1984	$8,400	8	0	800	800	800	800	800	800	800	800	800	0	6,400	5,600	4,800	4,000	3,200	2,400	1,600	800	0
356 4034	Gang Mower	1984	$8,400	8	0	800	800	800	800	800	800	800	800	800	0	6,400	5,600	4,800	4,000	3,200	2,400	1,600	800	0
366 6136	Gang Mower	1986	$7,000	8	0	0	0	875	875	875	875	875	875	875	0	0	0	7,000	6,125	5,250	4,375	3,500	2,625	1,750
366 6146	Gang Mower	1986	$7,000	8	0	0	0	875	875	875	875	875	875	875	0	0	0	7,000	6,125	5,250	4,375	3,500	2,625	1,750
466 9099	Gang Mower	1979	$17,000	8	2,125	2,125	2,125	2,125	2,125	0	0	0	0	0	8,500	6,375	4,250	2,125	0	0	0	0	0	0
466 9107	Gang Mower	1979	$17,000	8	2,125	2,125	2,125	2,125	2,125	0	0	0	0	0	8,500	6,375	4,250	2,125	0	0	0	0	0	0
566 30	Gang Mower	1980	$17,500	8	2,188	2,188	2,188	2,188	2,188	2,188	0	0	0	0	10,938	8,750	6,563	4,375	2,188	0	0	0	0	0
766 3046	Gang Mower	1983	$18,600	8	2,325	2,325	2,325	2,325	2,325	2,325	2,325	2,325	2,325	0	18,600	16,275	13,950	11,625	9,300	6,975	4,650	2,325	0	0
766 3073	Gang Mower	1983	$18,600	8	2,325	2,325	2,325	2,325	2,325	2,325	2,325	2,325	2,325	0	18,600	16,275	13,950	11,625	9,300	6,975	4,650	2,325	0	0
166 6605	Gang Mower	1988	$28,000	8	0	0	0	0	0	3,500	3,500	3,500	3,500	3,500	0	0	0	0	0	28,000	24,500	21,000	17,500	14,000
177 6697	Blower Attachment	1976	$50,000	15	3,333	3,333	3,333	3,333	3,333	3,333	3,333	3,333	3,333	0	26,667	23,333	20,000	16,667	13,333	10,000	6,667	3,333	(0)	0
377 5663	Blower Attachment	1975	$50,000	15	3,333	3,333	3,333	3,333	3,333	3,333	3,333	3,333	0	0	23,333	20,000	16,667	13,333	10,000	6,667	3,333	(0)	0	0

UNIT #	EQUIPMENT CLASS	MODEL	ORIGINAL PURCHASE PRICE	LIFE EXPECT	ANNUAL EQUIPMENT DEPRECIATION 1983	1984	1985	1986	1987	1988	1989	1990	1991	NEXT YEAR 1992	ANNUAL EQUIPMENT SALVAGE VALUE 1983	1984	1985	1986	1987	1988	1989	1990	1991	NEXT YEAR 1992
377 5869	Blower Attachment	1975	$50,000	15	3,333	3,333	3,333	3,333	3,333	3,333	3,333	3,333	0	0	23,333	20,000	16,667	13,333	10,000	6,667	3,333	(0)	0	0
377 9188	Blower Attachment	1979	$60,000	15	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	44,000	40,000	36,000	32,000	28,000	24,000	20,000	16,000	12,000	8,000
377 146	Blower Attachment	1980	$60,000	15	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	48,000	44,000	40,000	36,000	32,000	28,000	24,000	20,000	16,000	12,000
277 5914	Blower Attachment	1965	$25,000	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
277 5902	Blower Attachment	1965	$25,000	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
277 5930	Blower Attachment	1965	$25,000	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
577 9029	Blower Attachment	1989	$110,000	15	0	0	0	0	0	0	7,333	7,333	7,333	7,333	0	0	0	0	0	0	110,000	102,667	95,333	88,000
577 9035	Blower Attachment	1989	$110,000	15	0	0	0	0	0	0	7,333	7,333	7,333	7,333	0	0	0	0	0	0	110,000	102,667	95,333	88,000
577 9043	Blower Attachment	1989	$110,000	15	0	0	0	0	0	0	7,333	7,333	7,333	7,333	0	0	0	0	0	0	110,000	102,667	95,333	88,000
577 9030	Blower Attachment	1989	$110,000	15	0	0	0	0	0	0	7,333	7,333	7,333	7,333	0	0	0	0	0	0	110,000	102,667	95,333	88,000
202 2101	Loader/Snwblwr – fwd	1962	$30,000	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
202 2119	Loader/Snwblwr – fwd	1962	$30,000	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
218 5114	Compressor – Mounted	1973	$16,000	7	0	0	2,286	2,286	2,286	2,286	2,286	2,286	2,286	2,286	0	0	16,000	13,714	11,429	9,143	6,857	4,571	2,286	(0)
218 5122	Compressor – Mounted	1965	$16,000	7	0	0	2,286	2,286	2,286	2,286	2,286	2,286	2,286	2,286	0	0	16,000	13,714	11,429	9,143	6,857	4,571	2,286	(0)
218 1198	Compressor – Mounted	1991	$25,000	7	0	0	0	0	0	0	0	0	3,571	3,571	0	0	0	0	0	0	0	0	25,000	21,429
218 1196	Compressor – Mounted	1991	$25,000	7	0	0	0	0	0	0	0	0	3,571	3,571	0	0	0	0	0	0	0	0	25,000	21,429
650 9228	Sm'd Sweeper	1989	$20,000	10	0	0	0	0	0	0	2,000	2,000	2,000	2,000	0	0	0	0	0	0	20,000	18,000	16,000	14,000
257 4044	Large Roller	1974	$33,000	10	3,300	3,300	0	0	0	0	0	0	0	0	3,300	0	0	0	0	0	0	0	0	0
																								0
307 2543	Small Dozer	1982	$27,000	10	2,700	2,700	2,700	2,700	2,700	2,700	2,700	2,700	2,700	2,700	24,300	21,600	18,900	16,200	13,500	10,800	8,100	5,400	2,700	0
331 9084	Pothole Patcher	1989	$86,500	7	0	0	0	0	0	0	12,357	12,357	12,357	12,357	0	0	0	0	0	0	86,500	74,143	61,786	49,429
431 3474	Pothole Patcher	1983	$71,350	7	10,193	10,193	10,193	10,193	10,193	10,193	10,193	10,193	0	0	71,350	61,157	50,964	40,771	30,579	20,386	10,193	(0)	0	0
416 9025	5 Ton Dump Truck	1989	$91,000	5	0	0	0	0	0	0	18,200	18,200	18,200	18,200	0	0	0	0	0	0	91,000	72,800	54,600	36,400
416 9032	5 Ton Dump Truck	1989	$91,000	5	0	0	0	0	0	0	18,200	18,200	18,200	18,200	0	0	0	0	0	0	91,000	72,800	54,600	36,400
416 9041	5 Ton Dump Truck	1989	$91,000	5	0	0	0	0	0	0	18,200	18,200	18,200	18,200	0	0	0	0	0	0	91,000	72,800	54,600	36,400
416 9058	5 Ton Dump Truck	1989	$91,000	5	0	0	0	0	0	0	18,200	18,200	18,200	18,200	0	0	0	0	0	0	91,000	72,800	54,600	36,400
416 9066	5 Ton Dump Truck	1989	$91,000	5	0	0	0	0	0	0	18,200	18,200	18,200	18,200	0	0	0	0	0	0	91,000	72,800	54,600	36,400
416 9074	5 Ton Dump Truck	1988	$91,000	5	0	0	0	0	0	18,200	18,200	18,200	18,200	18,200	0	0	0	0	0	91,000	72,800	54,600	36,400	18,200
416 2442	5 Ton Dump Truck	1982	$41,000	5	8,200	8,200	8,200	8,200	8,200	0	0	0	0	0	32,800	24,600	16,400	8,200	0	0	0	0	0	0
416 3077	5 Ton Dump Truck	1983	$41,000	5	8,200	8,200	8,200	8,200	8,200	8,200	0	0	0	0	41,000	32,800	24,600	16,400	8,200	0	0	0	0	0

UNIT #	EQUIPMENT CLASS	MODEL	ORIGINAL PURCHASE PRICE	LIFE EXPECT	ANNUAL EQUIPMENT DEPRECIATION 1983	1984	1985	1986	1987	1988	1989	1990	1991	NEXT YEAR 1992	ANNUAL EQUIPMENT SALVAGE VALUE 1983	1984	1985	1986	1987	1988	1989	1990	1991	NEXT YEAR 1992
416 5155	5 Ton Dump Truck	1985	$82,500	5	0	0	12,500	12,500	12,500	12,500	12,500	12,500	0	0	0	0	62,500	50,000	37,500	25,000	12,500	0	0	0
416 5163	5 Ton Dump Truck	1985	$82,500	5	0	0	12,500	12,500	12,500	12,500	12,500	12,500	0	0	0	0	62,500	50,000	37,500	25,000	12,500	0	0	0
416 5171	5 Ton Dump Truck	1985	$82,500	5	0	0	12,500	12,500	12,500	12,500	12,500	12,500	0	0	0	0	62,500	50,000	37,500	25,000	12,500	0	0	0
416 6062	5 Ton Dump Truck	1986	$86,500	5	0	0	0	17,300	17,300	17,300	17,300	17,300	17,300	0	0	0	0	86,500	69,200	51,900	34,600	17,300	0	0
416 6070	5 Ton Dump Truck	1986	$86,500	5	0	0	0	17,300	17,300	17,300	17,300	17,300	17,300	0	0	0	0	86,500	69,200	51,900	34,600	17,300	0	0
416 6181	5 Ton Dump Truck	1986	$86,500	5	0	0	0	17,300	17,300	17,300	17,300	17,300	17,300	0	0	0	0	86,500	69,200	51,900	34,600	17,300	0	0
416 6179	5 Ton Dump Truck	1986	$86,500	5	0	0	0	17,300	17,300	17,300	17,300	17,300	17,300	0	0	0	0	86,500	69,200	51,900	34,600	17,300	0	0
416 6187	5 Ton Dump Truck	1986	$86,500	5	0	0	0	17,300	17,300	17,300	17,300	17,300	17,300	0	0	0	0	86,500	69,200	51,900	34,600	17,300	0	0
416 6195	5 Ton Dump Truck	1986	$86,500	5	0	0	0	17,300	17,300	17,300	17,300	17,300	17,300	0	0	0	0	86,500	69,200	51,900	34,600	17,300	0	0
416 6203	5 Ton Dump Truck	1986	$86,500	5	0	0	0	17,300	17,300	17,300	17,300	17,300	17,300	0	0	0	0	86,500	69,200	51,900	34,600	17,300	0	0
416 6211	5 Ton Dump Truck	1986	$86,500	5	0	0	0	17,300	17,300	17,300	17,300	17,300	17,300	0	0	0	0	86,500	69,200	51,900	34,600	17,300	0	0
416 6245	5 Ton Dump Truck	1986	$86,500	5	0	0	0	17,300	17,300	17,300	17,300	17,300	17,300	0	0	0	0	86,500	69,200	51,900	34,600	17,300	0	0
416 6252	5 Ton Dump Truck	1986	$86,500	5	0	0	0	17,300	17,300	17,300	17,300	17,300	17,300	0	0	0	0	86,500	69,200	51,900	34,600	17,300	0	0
416 7078	5 Ton Dump Truck	1987	$88,000	5	0	0	0	0	17,600	17,600	17,600	17,600	17,600	17,600	0	0	0	0	88,000	70,400	52,800	35,200	17,600	0
416 1066	5 Ton Dump Truck	1991	$95,000	5	0	0	0	0	0	0	0	0	19,000	19,000	0	0	0	0	0	0	0	0	95,000	76,000
416 1074	5 Ton Dump Truck	1991	$95,000	5	0	0	0	0	0	0	0	0	19,000	19,000	0	0	0	0	0	0	0	0	95,000	76,000
416 1082	5 Ton Dump Truck	1991	$95,000	5	0	0	0	0	0	0	0	0	19,000	19,000	0	0	0	0	0	0	0	0	95,000	76,000
416 1090	5 Ton Dump Truck	1991	$95,000	5	0	0	0	0	0	0	0	0	19,000	19,000	0	0	0	0	0	0	0	0	95,000	76,000
417 7200	Tandem Dump Truck	1987	$116,500	5	0	0	0	0	23,300	23,300	23,300	23,300	23,300	23,300	0	0	0	0	116,500	93,200	69,900	46,600	23,300	0
417 7218	Tandem Dump Truck	1987	$116,500	5	0	0	0	0	23,300	23,300	23,300	23,300	23,300	23,300	0	0	0	0	116,500	93,200	69,900	46,600	23,300	0
417 8448	Tandem Dump Truck	1988	$120,000	5	0	0	0	0	0	24,000	24,000	24,000	24,000	24,000	0	0	0	0	0	120,000	96,000	72,000	48,000	24,000
422 7013	Sewer Jet	1987	$90,000	8	0	0	0	0	11,250	11,250	11,250	11,250	11,250	11,250	0	0	0	0	90,000	78,750	67,500	56,250	45,000	33,750
501 7811	Grader	1987	$100,000	10	0	0	0	0	10,000	10,000	10,000	10,000	10,000	10,000	0	0	0	0	100,000	90,000	80,000	70,000	60,000	50,000
501 9286	Grader	1989	$110,000	10	0	0	0	0	0	0	11,000	11,000	11,000	11,000	0	0	0	0	0	0	110,000	99,000	88,000	77,000
501 6084	Grader	1986	$100,000	10	0	0	0	10,000	10,000	10,000	10,000	10,000	10,000	10,000	0	0	0	100,000	90,000	80,000	70,000	60,000	50,000	40,000
501 6092	Grader	1986	$100,000	10	0	0	0	10,000	10,000	10,000	10,000	10,000	10,000	10,000	0	0	0	100,000	90,000	80,000	70,000	60,000	50,000	40,000

APPENDIX I

TYPICAL FRAPOF O&M COST SPREADSHEET

APPENDIX I O & M COST MODULE PRESENT YEAR: 1991
LAST UPDATE: NOV.15/91

UNIT #		EQUIPMENT CLASS	MODEL	ANNUAL EQUIPMENT O & M COSTS 1983	1984	1985	1986	1987	1988	1989	1990	1991	YEAR TO-DATE COSTS
6	9013	Portable Compressor	1989						503	605	2,500	1,524	$5,132
6	9021	Portable Compressor	1989							1,180	2,667	2,670	$6,517
6	9039	Portable Compressor	1989							840	825	1,620	$3,285
6	1101	Portable Compressor	1981	825	1,984	2,988	2,964	1,679	2,305	2,470	2,400	2,100	$19,715
604	109	Sidewalk Plows	1981	6,012	5,867	16,588	14,169	14,479	15,140	15,060	22,120	12,430	$121,865
604	117	Sidewalk Plows	1981	2,748	5,159	10,154	9,175	16,392	15,735	15,760	13,065	9,486	$97,674
604	125	Sidewalk Plows	1981	2,128	4,737	13,673	5,343	20,046	14,710	14,699	12,658	13,520	$103,514
604	9290	Sidewalk Plows	1989							7,305	6,811	18,845	$32,961
74	8194	Sidewalk Plows	1988						18,964	19,950	47,450	42,354	$128,718
74	6156	Sidewalk Plows	1986					17,343	19,393	25,150	26,235	14,400	$102,521
74	6222	Sidewalk Plows	1986				5,747	24,819	25,002	22,430	28,233	20,469	$126,700
74	7220	Sidewalk Plows	1987					10,716	22,144	22,013	10,715	15,200	$80,788
74	8202	Sidewalk Plows	1988						16,990	16,032	23,280	16,200	$72,502
74	9184	Sidewalk Plows	1989							8,070	47,435	4,644	$60,149
74	9168	Sidewalk Plows	1989							15,900	11,470	20,077	$47,447
102	7598	Loader	1987						16,715	19,121	20,120	21,730	$77,686
302	3512	Loader	1973	31,382	29,006	35,872	32,331	46,115	22,750	22,364	22,370	22,467	$224,657
102	7606	Loader	1987						18,014	18,129	19,034	22,188	$77,365
302	5608	Loader	1975	33,165	12,507	27,402	34,501	40,836	37,724	38,862	12,619	60,123	$297,739
402	9369	Loader	1989							7,507	15,390	23,830	$46,727

UNIT #		EQUIPMENT CLASS	MODEL	ANNUAL EQUIPMENT O & M COSTS									YEAR TO-DATE COSTS
				1983	1984	1985	1986	1987	1988	1989	1990	1991	
402	9377	Loader	1989							8,725	14,535	23,299	$46,559
102	6012	Loader	1986					22,255	39,020	39,400	31,155	32,170	$164,000
102	6020	Loader	1986					24,220	41,011	43,639	21,696	32,740	$163,306
202	2127	Loader	1981	8,705	19,220	35,365	50,069	54,156	26,800	37,504	36,200	16,250	$284,269
202	9163	Loader	1979	19,047	23,690	24,516	28,049	31,652	52,200	29,900	19,240	39,700	$267,994
302	161	Loader	1980	21,079	40,021	46,905	59,531	56,748	40,035	39,092	18,072	45,165	$366,648
302	5012	Loader	1985			9,969	21,013	23,394	37,002	36,154	35,410	47,200	$210,142
302	5020	Loader	1985			9,106	19,005	25,780	63,332	64,094	39,200	33,479	$253,996
402	442	Loader	1990								11,700	20,574	$32,274
402	434	Loader	1990								11,300	27,120	$38,420
402	459	Loader	1990								8,275	15,200	$23,475
110	9206	1/2 Ton Pickup	1989							1,020	2,271	2,807	$6,098
110	9214	1/2 Ton Pickup	1989							1,854	7,777	4,332	$13,963
110	9222	1/2 Ton Pickup	1989							2,491	5,130	3,883	$11,504
110	9230	1/2 Ton Pickup	1989							2,917	8,745	5,851	$17,513
110	9248	1/2 Ton Pickup	1989							3,225	6,212	8,932	$18,369
110	3399	1/2 Ton Pickup	1983		1,510	1,825	3,255	4,194	3,288	3,514	5,804	7,799	$31,189
110	9255	1/2 Ton Pickup	1989							9,715	6,025	5,812	$21,552
110	9263	1/2 Ton Pickup	1989							662	2,100	2,908	$5,670
110	9271	1/2 Ton Pickup	1989							1,544	3,008	3,794	$8,346
110	5030	1/2 Ton Pickup	1985			2,994	4,704	6,318	16,005	15,028	9,530	17,268	$71,847
110	5261	1/2 Ton Pickup	1985			2,044	5,122	9,188	8,654	8,156	3,780	11,006	$47,950
110	6152	1/2 Ton Pickup	1986				1,929	5,016	6,300	6,724	14,200	15,300	$49,469
110	6244	1/2 Ton Pickup	1986				3,271	12,737	9,443	11,148	12,250	3,532	$52,381

UNIT #		EQUIPMENT CLASS	MODEL	ANNUAL EQUIPMENT O & M COSTS									YEAR TO-DATE COSTS
				1983	1984	1985	1986	1987	1988	1989	1990	1991	
110	6335	1/2 Ton Pickup	1986					6,662	10,218	11,823	8,043	1,879	$38,625
210	8389	1/2 Ton Pickup	1988						4,664	5,174	11,250	5,150	$26,238
210	8397	1/2 Ton Pickup	1988						8,065	9,025	4,260	11,269	$32,619
210	8405	1/2 Ton Pickup	1988						4,978	4,733	7,977	11,138	$28,826
210	8413	1/2 Ton Pickup	1988						2584	2500	3000	5,780	$13,864
210	8421	1/2 Ton Pickup	1988						7,290	7,187	11,100	2,900	$28,477
210	8439	1/2 Ton Pickup	1988						2,879	2,840	4,537	7,620	$17,876
210	6201	1/2 Ton Pickup	1986					4,584	11,043	11,708	8,015	11,160	$46,510
210	6219	1/2 Ton Pickup	1986					3,337	7,089	7,612	5,825	5,920	$29,783
210	6227	1/2 Ton Pickup	1986					4,853	14,230	12,640	9,274	9,190	$50,187
210	6235	1/2 Ton Pickup	1986					3,950	8,656	8,147	8,520	5,644	$34,917
210	7050	1/2 Ton Pickup	1987					2,306	7,942	8,325	6,501	5,468	$30,542
210	7068	1/2 Ton Pickup	1987					2,061	2,040	1,870	3,554	8,050	$17,575
210	7092	1/2 Ton Pickup	1987					1,749	3,560	3,591	5,310	569	$14,779
210	7100	1/2 Ton Pickup	1987					2,221	13,560	13,667	8,824	11,400	$49,672
210	7118	1/2 Ton Pickup	1987					2,484	6,434	6,158	6,895	12,972	$34,943
210	7126	1/2 Ton Pickup	1987					6,662	2,480	2,856	5,350	12,170	$29,518
210	7134	1/2 Ton Pickup	1987					1,420	6,353	6,523	2,465	3,155	$19,916
210	7142	1/2 Ton Pickup	1987					1,799	6,940	7,005	5,960	10,086	$31,790
210	7159	1/2 Ton Pickup	1987					2,297	7,120	7,735	6,920	8,119	$32,191
210	7167	1/2 Ton Pickup	1987					1,968	6,159	9,037	8,870	5,420	$31,454
210	7175	1/2 Ton Pickup	1987					3,767	5,100	5,349	7,820	5,475	$27,511
210	7183	1/2 Ton Pickup	1987					1,971	7,727	8,894	8,780	9,486	$36,85[illegible]
110	9099	1/2 Ton Pickup	1989										$0
210	139	1/2 Ton Pickup	1990								200	2,036	$2,236

UNIT #		EQUIPMENT CLASS	MODEL	ANNUAL EQUIPMENT O & M COSTS 1983	1984	1985	1986	1987	1988	1989	1990	1991	YEAR TO-DATE COSTS
210	147	1/2 Ton Pickup	1990								185	1,885	$2,070
210	155	1/2 Ton Pickup	1990									1,635	$1,635
210	238	1/2 Ton Pickup	1990								4,920	3,810	$8,730
210	246	1/2 Ton Pickup	1990								5,510	7,093	$12,603
210	253	1/2 Ton Pickup	1990								4,950	3,586	$8,536
210	261	1/2 Ton Pickup	1990								5,415	7,245	$12,660
210	279	1/2 Ton Pickup	1990								3,540	3,805	$7,345
210	1152	1/2 Ton Pickup	1991										$0
111	8512	One Ton Truck	1988						3,605	3,750	9,760	7,210	$24,325
111	8538	One Ton Truck	1988						7,340	7,983	7,270	6,817	$29,410
111	5286	One Ton Truck	1985			1,555	6,284	8,552	13,934	15,599	11,150	21,379	$78,453
111	5294	One Ton Truck	1985			3,179	7,832	7,759	15,029	14,663	12,300	11,010	$71,772
111	6342	One Ton Truck	1986					3,248	8,468	9,296	14,890	5,553	$41,455
111	6359	One Ton Truck	1986					8,898	8,775	8,456	7,960	10,089	$44,178
111	6367	One Ton Truck	1986					6,320	7,457	7,874	13,120	15,817	$50,588
211	6259	One Ton Truck	1986					2,758	9,760	10,444	6,085	14,02	$43,072
211	7018	One Ton Truck	1987					3,259	2,182	2,483	8,802	4,704	$21,430
211	7026	One Ton Truck	1987					3,882	4,671	4,198	4,415	12,426	$29,592
211	8487	One Ton Truck	1988						8,769	9,814	20,348	20,628	$59,559
211	8503	One Ton Truck	1988						7,486	7,698	11,365	16,143	$42,692
211	9300	One Ton Truck	1989							966	3,544	6,244	$10,754
211	8495	One Ton Truck	1988						8,576	7,448	9,670	18,823	$44,517
211	7190	One Ton Truck	1987						11,656	11,725	10,420	10,990	$44,791
211	13	One Ton Truck	1990								7,620	5,265	$12,885

UNIT #		EQUIPMENT CLASS	MODEL	ANNUAL EQUIPMENT O & M COSTS 1983	1984	1985	1986	1987	1988	1989	1990	1991	YEAR TO-DATE COSTS
211	54	One Ton Truck	1990									2,370	$2,370
211	302	One Ton Truck	1990									3,630	$3,630
211	9212	One Ton Truck	1989								1,974	6,530	$8,504
311	1168	One Ton Truck	1991									4,362	$4,362
111	8520	One Ton Truck	1988						19,831	20,930	19,058	11,410	$71,229
211	1177	Utility Truck	1991									8,999	$8,999
113	8783	VAN	1988						2,488	2,986	4,210	6,842	$16,526
112	5244	VAN	1985			5,054	9,406	5,884	11,240	12,685	11,545	10,399	$66,213
212	6167	VAN	1986					3,888	7,903	6,713	9,691	9,699	$37,894
212	6175	VAN	1986					1,236	8,027	8,515	10,910	6,562	$35,250
212	6233	VAN	1986				1,156	4,170	4,270	3,268	6,730	4,552	$24,146
212	8577	VAN	1988						319	5,441	764	5,311	$11,835
312	8543	VAN	1988						2,640	2,287	6,383	11,951	$23,261
112	96	VAN	1990								340	4,043	$4,383
112	104	VAN	1990								520	3,689	$4,209
112	112	VAN	1990								215	2,781	$2,996
212	46	VAN	1990								1,040	4,766	$5,806
212	61	VAN	1990								417	876	$1,293
212	79	VAN	1990								924	1,420	$2,344
212	87	VAN	1990								602	1,380	$1,982
212	285	VAN	1990								2,221	4,581	$6,802
212	293	VAN	1990								3,207	3,807	$7,014
312	1209	VAN	1991									4,780	$4,780

UNIT #		EQUIPMENT CLASS	MODEL	ANNUAL EQUIPMENT O & M COSTS 1983	1984	1985	1986	1987	1988	1989	1990	1991	YEAR TO-DATE COSTS
312	1217	VAN	1991									1,425	$1,425
312	1365	VAN	1991									451	$451
114	5085	Small Pick-up	1985			1,021	1,584	3,187	8,934	9,170	5,520	3,942	$33,358
114	8154	Small Pick-up	1988						2,700	2,800	4,735	5,599	$15,834
114	8378	Small Pick-up	1988						1,392	1,272	2,160	9,898	$14,722
214	9839	Small Pick-up	1989							1,858	1,910	3,502	$7,270
114	334	Small Pick-up	1990								1,780	718	$2,498
214	28	Small Pick-up	1990								606	1,002	$1,608
214	36	Small Pick-up	1990								833	1,508	$2,341
120	5228	Hoist Truck	1985				8413	10,929	15,821	17,493	13,670	8,745	$75,071
120	5236	Hoist Truck	1985				8,062	11,299	14,380	14,450	7,550	12,140	$67,881
420	2065	Hoist Truck	1982	2,262	2,927	6,832	9,668	11,255	10,900	13,023	17,840	15,187	$89,894
124	3492	25 Yd Collectomatic	1983		9,219	21,375	25,688	25,224	32,610	30,749	22,930	32,005	$199 800
424	5098	25 Yd Collectomatic	1985			8,833	22,514	21,927	41,040	38,364	41,250	39,620	$213,548
424	6047	25 Yd Collectomatic	1986					11,473	28,750	34,289	32,240	41,520	$148,272
424	6054	25 Yd Collectomatic	1986					13,931	26,960	26,704	38,115	33,800	$139,510
424	6278	25 Yd Collectomatic	1986					21,622	44,795	38,804	44,105	31,198	$180,524
424	7037	25 Yd Collectomatic	1987						35,015	37,322	25,810	36,120	$134,267
424	7094	25 Yd Collectomatic	1987						36,420	38,275	36,200	48,533	$159,428
424	7102	25 Yd Collectomatic	1987						30,890	36,184	44,720	60,314	$172,108
424	7110	25 Yd Collectomatic	1987						36,409	37,900	44,305	45,091	$163,705
424	7128	25 Yd Collectomatic	1987						34,764	37,850	39,455	43,510	$155,579

UNIT #		EQUIPMENT CLASS	MODEL	ANNUAL EQUIPMENT O & M COSTS 1983	1984	1985	1986	1987	1988	1989	1990	1991	YEAR TO-DATE COSTS
424	7144	25 Yd Collectomatic	1987						35,500	37,805	33,105	61,508	$167,918
424	5569	25 Yd Collectomatic	1985						46,241	45,450	45,785	51,178	$188,654
424	8811	25 Yd Collectomatic	1988						14,608	17,700	19,908	44,964	$97,180
424	8829	25 Yd Collectomatic	1988						12,131	14,625	22,645	37,158	$86,559
426	1020	25 Yd Collectomatic	1991									7,179	$7,179
426	1038	25 Yd Collectomatic	1991									7,982	$7,982
426	1111	25 Yd Collectomatic	1991									3,480	$3,480
125	3483	16 Yd collectomatic	1983		6,077	16,910	26,618	29,320	30,825	32,045	22,520	44,760	$209,075
425	2524	16 Yd collectomatic	1982	9,593	21,401	24,581	23,639	29,182	57,820	56,829	20,045	19,640	$262,730
425	2532	16 Yd collectomatic	1982	13,720	20,017	49,736	33,228	34,160	22,005	24,660	23,915	31,826	$253,267
425	5105	16 Yd collectomatic	1985			12,019	18,081	24,941	25,632	27,500	36,840	24,708	$169,721
428	6290	Water Tanker	1986				11,235	13,208	29,934	34,045	25,087	35,912	$149,421
237	8644	Compact Cars	1988							2,462	1,790	1,320	$5,572
137	5310	Compact Cars	1985				1,098	2,049	6,694	3,830	5,420	3,262	$22,353
237	1102	Compact Cars	1991									2,065	$2,065
237	5111	Compact Cars	1985					1,484	900	2,840	9,620	1,460	$16,304
237	5129	Compact Cars	1985					3,598	5,198	7,582	9,740	11,477	$37,595
237	5137	Compact Cars	1985					2,189	4,174	3,799	1,345	3,965	$15,472
237	5145	Compact Cars	1985					1,391	9,085	9,212	7,180	8,553	$35,421
237	7042	Compact Cars	1987					1,071	1,829	2,116	3,220	6,144	$14,380
237	8651	Compact Cars	1988						783	2,462	3,470	1,057	$7,772
237	8669	Compact Cars	1988						708	717	1,480	1,347	$4,252

UNIT #		EQUIPMENT CLASS	MODEL	ANNUAL EQUIPMENT O & M COSTS 1983	1984	1985	1986	1987	1988	1989	1990	1991	YEAR TO-DATE COSTS
237	8677	Compact Cars	1988						802	684	475	1,460	$3,421
237	8685	Compact Cars	1988						579	759	767	951	$3,056
237	8701	Compact Cars	1988						1,000	944	1,824	1,734	$5,502
237	8719	Compact Cars	1988						530	508	1,035	810	$2,883
237	8727	Compact Cars	1988						467	460	662	1,609	$3,198
237	8735	Compact Cars	1988						486	473	1,194	1,503	$3,656
237	8743	Compact Cars	1988						366	2,248	2,505	1,400	$6,519
237	8750	Compact Cars	1988						2,444	2,389	968	749	$6,550
237	8768	Compact Cars	1988						879	883	2,067	2,321	$6,150
237	8776	Compact Cars	1988						280	328	1,688	679	$2,975
237	9147	Compact Cars	1989							83	847	1,707	$2,637
237	9154	Compact Cars	1989							18	658	1,034	$1,710
237	9162	Compact Cars	1989								250	1,281	$1,531
237	9170	Compact Cars	1989								1,496	1,291	$2,787
237	1102	Compact Cars	1991										$0
146	8651	Street Broom	1978	12,349	27,740	23,889	34,852	33,000	43,204	41,133	27,240	36,700	$280,107
146	8586	Street Broom	1988						27,726	32,600	45,325	64,018	$169,669
546	6305	Street Broom	1986				14,139	26,359	33,742	36,377	41,505	41,025	$193,147
252	2134	Large Backhoe	1991										$0
354	7080	Small Backhoe	1987						8,340	8,345	15,940	14,200	$46,825
354	8690	Small Backhoe	1988						6,030	6,118	11,547	20,936	$44,631

UNIT #		EQUIPMENT CLASS	MODEL	ANNUAL EQUIPMENT O & M COSTS 1983	1984	1985	1986	1987	1988	1989	1990	1991	YEAR TO-DATE COSTS
466	5709	Gang Mower	1965		762	2,237	2,640	1,544	1,905	1,960	1,060	2,520	$14,628
466	7275	Gang Mower	1977	1,939	1,582	3,496	1,887	2,035	2,405	2,654	2,417	10,063	$28,478
166	2048	Gang Mower	1982	1,389	8,048	8,810	7,503	2,795	2,017	883	621	4,760	$36,826
366	4026	Gang Mower	1984		27	655	1,717	2,587	1,372	2,194	3,670	2,350	$14,572
366	4034	Gang Mower	1984		54	1,245	937	1,385	2,262	2,317	1,702	3,843	$13,745
366	6138	Gang Mower	1986				733	3,742	2,492	2,821	2,572	2,795	$15,155
366	6146	Gang Mower	1986				494	1,917	4,477	3,234	2,919	4,046	$17,087
466	9099	Gang Mower	1979	4,285	669	343	4,394	3,058	5,539	5,339	2,687	5,159	$31,473
466	9107	Gang Mower	1979	990	1,609	692	225	1,699	1,495	1,229	2,166	1,656	$11,761
566	30	Gang Mower	1980	2,979	1,320	1,255	4,435	1,551	1,741	1,705	584	1,950	$17,520
766	3048	Gang Mower	1983		28	50	90	306	1,864	2,057	2,020	4,375	$10,790
766	3073	Gang Mower	1983		3,332	2,710	1,954	1,187	822	1,080	1,231	1,884	$14,200
166	8805	Gang Mower	1988						3,775	3,550	1,353	9,632	$18,310
177	6897	Blower Attachment	1976	1,269	30/	569	28,112	32,653	7,865	7,815	3,230	1,657	$83,474
377	5863	Blower Attachment	1975	1,112	3,756	4,373	4,655	17,285	17,490	15,632	3,640	14,200	$82,143
377	5889	Blower Attachment	1975	8,991	473	5,225	4,246	8,824	19,042	14,550	4,460	8,550	$74,361
377	9188	Blower Attachment	1979	5,598	3,233	8,446	13,038	24,070	34,209	34,220	4,120	15,230	$142,164
377	146	Blower Attachment	1980	3,766	3,050	4,617	4,122	21,498	26,023	26,650	7,048	9,739	$106,813
277	5914	Blower Attachment	1965	7,495	575	5,396	3,843	16,058	30,800	38,430	25,260	14,329	$142,186
277	5922	Blower Attachment	1965	6,092	2,636	8,728	16,054	24,114	48,643	45,550	17,700	12,240	$181,757
277	5930	Blower Attachment	1965	1,829	939	6,896	10,536	24,493	26,215	25,500	18,115	16,829	$133,352
577	9329	Blower Attachment	1989							21,693	10,400	28,400	$60,493
577	9335	Blower Attachment	1989							13,700	19,650	13,100	$46,450
577	9343	Blower Attachment	1989							10,640	25,015	22,240	$57,895

UNIT #		EQUIPMENT CLASS	MODEL	ANNUAL EQUIPMENT O & M COSTS 1983	1984	1985	1986	1987	1988	1989	1990	1991	YEAR TO-DATE COSTS
577	9350	Blower Attachment	1989							24,300	9,505	18,200	$52,005
202	2101	Loader/Snowblower – fixed	1962	28,420	4,636	7,420	17,552	43,272	35,421	38,900	32,415	25,405	$233,441
202	2119	Loader/Snowblower – fixed	1962	18,233	7,827	13,554	15,977	44,727	28,010	31,700	30,059	29,556	$219,643
													$0
218	5114	Compressor – Mounted	1985			3,432	6,377	9,488	13,023	10,195	11,635	12,766	$66,916
218	5122	Compressor – Mounted	1985			2,149	3,830	5,796	8,913	8,925	7,336	12,553	$49,502
218	1188	Compressor – Mounted	1991									5,565	$5,565
218	1196	Compressor – Mounted	1991									10,452	$10,452
650	9228	Small Sweeper	1989							125	3,344	2,819	$6,288
257	4044	Large Roller	1974	4,756	4,617	1,120	5,671	5,429	3,570	3,480	9,050	1,650	$39,343
307	2543	Small Dozer	1982	2,946	24,729	7,573	17,322	888	4,655	1,032	1,250	6,603	$66,998
331	9084	Pothole Patcher	1989							2,045	10,090	9,814	$21,949
431	3474	Pothole Patcher	1983		4,711	9,939	10,671	20,244	9,791	9,355	13,467	21,630	$99,808
416	9025	5 Ton Dump Truck	1989							9,004	16,946	22,290	$48,240
416	9033	5 Ton Dump Truck	1989							11,600	24,100	45,034	$80,734
416	9041	5 Ton Dump Truck	1989							6,823	16,155	23,291	$46,269
416	9058	5 Ton Dump Truck	1989							4,365	20,045	24,613	$49,023
416	9066	5 Ton Dump Truck	1989							4,420	21,340	30,985	$56,745
416	9074	5 Ton Dump Truck	1988						4,703	6,495	25,660	36,912	$73,770

UNIT #		EQUIPMENT CLASS	MODEL	ANNUAL EQUIPMENT O & M COSTS									YEAR TO-DATE
				1983	1984	1985	1986	1987	1988	1989	1990	1991	COSTS
416	2442	5 Ton Dump Truck	1982	5373	6,842	11,256	22,948	9,707	14,760	10,768	16,946	9,075	$107,675
416	3077	5 Ton Dump Truck	1983	2,099	4,384	4,070	7,527	25,091	24,631	25,987	16,900	20,678	$131,367
416	5155	5 Ton Dump Truck	1985				30,855	36,296	52,550	53,426	47,120	33,320	$253,567
416	5163	5 Ton Dump Truck	1985				17,938	27,665	28,200	30,868	25,300	47,514	$177,485
416	5171	5 Ton Dump Truck	1985				23,158	37,729	28,700	31,583	32,500	35,736	$189,406
416	6062	5 Ton Dump Truck	1986					17,245	33,300	25,824	36,330	58,200	$170,899
416	6070	5 Ton Dump Truck	1986					22,900	28,260	25,468	49,320	33,223	$159,171
416	6161	5 Ton Dump Truck	1986				12,059	20,574	40,820	38,558	25,700	46,091	$183,802
416	6179	5 Ton Dump Truck	1986				8,946	23,859	27,043	30,731	31,250	50,173	$172,002
416	6187	5 Ton Dump Truck	1986				7,884	15,195	35,328	35,279	23,540	36,782	$154,008
416	6195	5 Ton Dump Truck	1986				8,400	20,449	45,900	46,661	20,800	52,100	$194,310
416	6203	5 Ton Dump Truck	1986				7,298	14,829	21,650	22,350	23,001	37,524	$126,652
416	6211	5 Ton Dump Truck	1986				10,170	23,657	27,348	28,425	47,980	38,479	$176,059
416	6245	5 Ton Dump Truck	1986					7,961	15,985	16,260	16,710	29,421	$86,337
416	6252	5 Ton Dump Truck	1986					7,691	13,790	15,445	19,320	19,418	$75,664
416	7078	5 Ton Dump Truck	1987					10,891	28,120	27,478	19,500	37,601	$123,590
416	1066	5 Ton Dump Truck	1991									1304	$1,304
416	1074	5 Ton Dump Truck	1991									1370	$1,370
416	1082	5 Ton Dump Truck	1991									2761	$2,761
416	1090	5 Ton Dump Truck	1991									1118	$1,118
417	7200	Tandem Dump Truck	1987					21,923	46,450	55,789	45,800	55,820	$225,782
417	7218	Tandem Dump Truck	1987					27,310	61,045	55,116	44,250	62,463	$250,184
417	8448	Tandem Dump Truck	1988						33,800	42,059	40,550	39,889	$156,298

UNIT #		EQUIPMENT CLASS	MODEL	ANNUAL EQUIPMENT O & M COSTS 1983	1984	1985	1986	1987	1988	1989	1990	1991	YEAR TO-DATE COSTS
422	7013	Sewer Jet	1987						11,190	14,360	18,525	22,020	$66,095
501	7611	Grader	1987						28390	32,873	23,990	44,044	$129,297
501	9286	Grader	1989							14,376	33,312	38,150	$85,838
501	6084	Grader	1986					25,013	46,120	37,863	31,005	24,390	$164,391
501	6092	Grader	1986					27,831	42,243	42,039	20,648	27,763	$160,524

APPENDIX J

TYPICAL FRAPOF FORECASTING MODULE

APPENDIX J PRESENT YEAR: 1991 FORECASTING MODULE FOR YEAR: 1992

UNIT #	EQUIP. CLASS	MODEL	O & M COSTS FOR THE YEAR: 1983	1984	1985	1986	1987	1988	1989	1990	1991	X1	X2	X3	X4	X5	X6	X7	X8	X9	SUM Y's	SUM X's	#	SUM XY's	SUM X2	COEFF.	CONST.	COST NEXT YEAR	EQUIP. COST NEW
6	9013 Portable Compressor	1989						503	605	2,500	1,524	0	0	0	0	0	1	2	3	4	5,132	10	4	15,309	30	496	44	$2,523	$20,600
6	9021 Portable Compressor	1989							1,160	2,667	2,670	0	0	0	0	0	0	1	2	3	6,517	6	3	14,524	14	745	632	$3,662	$20,600
6	9039 Portable Compressor	1989							840	825	1,620	0	0	0	0	0	0	0	1	2	3,285	6	3	7,350	14	390	315	$1,875	$20,600
6	1101 Portable Compressor	1981	825	1,984	2,988	2,964	1,679	2,305	2,470	2,400	2,100	1	2	3	4	5	6	7	8	9	19,715	45	9	103,226	285	76	1,603	$2,578	$20,600
604	109 Sidewalk Plows	1981	6,012	5,867	16,568	14,169	14,479	15,140	15,060	22,120	12,430	1	2	3	4	5	6	7	8	9	121,865	45	9	681,671	285	1,206	[illegible]	$10,569	$62,400
604	117 Sidewalk Plows	1981	2,748	5,159	10,154	9,175	16,392	15,735	15,750	13,365	9,466	1	2	3	4	5	6	7	8	9	97,574	45	9	556,812	285	1,141	[illegible]	$16,556	$62,400
604	125 Sidewalk Plows	1981	2,128	4,737	13,673	5,343	20,046	14,710	14,699	12,858	15,520	1	2	3	4	5	6	7	8	9	103,514	45	9	606,320	285	1,479	[illegible]	$18,897	$62,400
604	9290 Sidewalk Plows	1989							7,305	6,811	18,845	0	0	0	0	0	0	1	2	3	32,961	6	3	77,462	14	5,770	(553)	$22,527	$62,400
74	8194 Sidewalk Plows	1988						18,954	19,950	47,450	42,354	0	0	0	0	0	0	1	2	3	4	128,718	10	4	370,630	30	9,767	7,782	$56,597	$62,400
74	6156 Sidewalk Plows	1986					17,343	19,393	25,150	26,235	14,400	0	0	0	0	1	2	3	4	5	102,521	15	5	308,519	55	96	20,217	$20,791	$62,400
74	6222 Sidewalk Plows	1986				5,747	24,819	25,002	22,430	28,233	20,469	0	0	0	1	2	3	4	5	6	126,700	21	6	484,090	91	2,322	12,969	$29,245	$62,400
74	7220 Sidewalk Plows	1987					10,716	22,144	22,013	10,715	15,200	0	0	0	0	0	1	2	3	4	5	80,788	15	5	239,903	55	(245)	16,896	$15,419	$62,400
74	8202 Sidewalk Plows	1988						16,990	16,032	23,280	16,200	0	0	0	0	0	0	1	2	3	4	72,502	10	4	183,694	30	486	16,906	$19,345	$62,400
74	9184 Sidewalk Plows	1989							6,070	47,435	4,644	0	0	0	0	0	0	0	1	2	3	60,149	6	3	116,872	14	(1,713)	23,476	$16,624	$62,400
74	9168 Sidewalk Plows	1989							15,900	11,470	20,077	0	0	0	0	0	0	0	1	2	3	47,447	6	3	99,071	14	2,089	11,639	$19,993	$62,400
102	7593 Loader	1987						16,715	19,121	20,120	21,730	0	0	0	0	0	0	1	2	3	4	77,686	10	4	202,237	30	1,604	15,411	$23,433	$160,000
302	3512 Loader	1973	31,382	29,006	35,672	32,331	46,115	22,750	22,364	2,370	2,467	1	2	3	4	5	6	7	8	9	224,657	45	9	891,120	285	(3,869)	44,309	$5,615	$160,000
102	7606 Loader	1987						18,014	18,129	19,034	22,188	0	0	0	0	0	0	1	2	3	4	77,365	10	4	200,126	30	1,343	15,965	$22,696	$160,000
302	5608 Loader	1975	33,165	12,507	27,402	34,501	40,836	37,724	38,852	12,619	60,123	1	2	3	4	5	6	7	8	9	297,739	45	9	1,523,006	285	2,239	21,890	$44,275	$160,000
402	9369 Loader	1989							7,507	15,390	23,830	0	0	0	0	0	0	0	1	2	3	46,727	6	3	109,777	14	8,152	(747)	$31,899	$160,000
402	9377 Loader	1989							8,725	14,535	23,299	0	0	0	0	0	0	0	1	2	3	46,559	6	3	107,892	14	7,287	946	$30,094	$160,000
102	6012 Loader	1986					22,255	39,020	39,400	31,155	32,170	0	0	0	0	0	1	2	3	4	5	164,000	15	5	503,965	55	1,197	29,211	$36,390	$160,000
102	6020 Loader	1986					24,220	41,011	43,639	21,896	32,740	0	0	0	0	0	1	2	3	4	5	163,306	15	5	487,643	55	(228)	33,344	$31,979	$160,000
202	2127 Loader	1981	8,705	19,220	35,365	50,069	54,156	26,800	37,504	36,200	16,250	1	2	3	4	5	6	7	8	9	284,269	45	9	1,483,474	285	1,035	26,406	$36,763	$160,000
202	9163 Loader	1979	19,047	23,690	24,516	26,049	31,652	52,200	29,900	19,240	39,700	1	2	3	4	5	6	7	8	9	267,994	45	9	1,444,151	285	1,736	21,095	$38,459	$160,000
302	161 Loader	1960	21,079	40,021	46,905	58,531	56,748	40,035	39,092	18,072	45,165	1	2	3	4	5	6	7	8	9	366,648	45	9	1,828,615	285	(77)	41,124	$40,353	$160,000
302	5012 Loader	1985			9,969	21,013	23,394	37,002	36,154	35,410	47,200	0	0	1	2	3	4	5	6	7	210,142	28	7	993,815	140	5,473	8,128	$51,913	$160,000
302	5020 Loader	1985			9,106	19,005	25,780	63,332	64,054	39,200	33,479	0	0	1	2	3	4	5	6	7	253,996	28	7	1,167,807	140	5,422	14,596	$57,974	$160,000
402	442 Loader	1990								11,700	20,574	0	0	0	0	0	0	0	1	2	32,274	3	2	52,648	5	8,874	2,826	$29,448	$160,000
402	434 Loader	1990								11,300	27,120	0	0	0	0	0	0	0	1	2	38,420	3	2	65,540	5	15,820	(4,530)	$42,940	$160,000
402	459 Loader	1990								8,275	15,200	0	0	0	0	0	0	0	1	2	23,475	3	2	38,675	5	6,925	1,350	$22,125	$160,000
110	9206 1/2 Ton Pickup	1989							1,026	2,271	2,807	0	0	0	0	0	0	1	2	3	6,098	6	3	13,983	14	894	246	$3,820	$14,700
110	9214 1/2 Ton Pickup	1989							1,854	7,777	4,332	0	0	0	0	0	0	1	2	3	13,963	6	3	30,404	14	1,239	2,176	$7,132	$14,700
110	9222 1/2 Ton Pickup	1989							2,491	5,130	3,883	0	0	0	0	0	0	1	2	3	11,504	6	3	24,400	14	696	2,443	$5,227	$14,700
110	9230 1/2 Ton Pickup	1989							2,917	8,740	5,851	0	0	0	0	0	0	1	2	3	17,513	6	3	37,960	14	1,467	2,904	$8,772	$14,700
110	9248 1/2 Ton Pickup	1989							3,225	6,212	8,932	0	0	0	0	0	0	1	2	3	18,369	6	3	42,445	14	2,854	418	$11,830	$14,700
110	3399 1/2 Ton Pickup	1983		1,510	1,825	3,255	4,194	3,268	3,514	5,804	7,799	0	1	2	3	4	5	6	7	8	31,169	36	6	172,245	204	759	481	$7,316	$14,700
110	9255 1/2 Ton Pickup	1989							9,715	6,025	5,812	0	0	0	0	0	0	1	2	3	21,552	6	3	39,201	14	(1,952)	11,087	$3,281	$14,700
110	9263 1/2 Ton Pickup	1989							662	2,100	2,908	0	0	0	0	0	0	1	2	3	5,670	6	3	13,566	14	1,123	(356)	$4,136	$14,700
110	9271 1/2 Ton Pickup	1989							1,544	3,008	3,794	0	0	0	0	0	0	1	2	3	8,346	6	3	18,942	14	1,125	532	$5,032	$14,700
110	5030 1/2 Ton Pickup	1985			2,994	4,704	6,318	16,005	15,026	9,530	17,256	0	0	1	2	3	4	5	6	7	71,847	28	7	348,572	140	2,185	1,523	$19,004	$14,700
110	5261 1/2 Ton Pickup	1985			2,044	5,122	9,188	8,654	8,156	3,780	11,006	0	0	1	2	3	4	5	6	7	47,950	28	7	214,970	140	828	3,540	$10,160	$14,700
110	6152 1/2 Ton Pickup	1986				1,929	5,016	6,300	6,724	14,200	15,300	0	0	0	1	2	3	4	5	6	49,469	21	6	220,557	91	2,709	(1,236)	$17,726	$14,700
110	6244 1/2 Ton Pickup	1986				3,271	12,737	9,443	11,148	12,250	3,532	0	0	0	1	2	3	4	5	6	52,381	21	6	184,108	91	44	8,575	$8,685	$14,700
110	6335 1/2 Ton Pickup	1986					6,662	10,218	11,823	8,043	1,879	0	0	0	0	1	2	3	4	5	38,625	15	5	104,134	55	(1,174)	11,247	$4,203	$14,700
210	8389 1/2 Ton Pickup	1988						4,664	5,174	11,250	5,150	0	0	0	0	0	0	1	2	3	4	26,238	10	4	69,362	30	753	4,676	$8,443	$14,700
210	8397 1/2 Ton Pickup	1988						8,065	9,025	4,250	11,269	0	0	0	0	0	0	1	2	3	4	32,619	10	4	83,971	30	485	6,943	$9,367	$14,700
210	8405 1/2 Ton Pickup	1988						4,978	4,733	7,977	11,138	0	0	0	0	0	0	1	2	3	4	28,826	10	4	82,927	30	2,172	1,776	$12,636	$14,700
210	8413 1/2 Ton Pickup	1988						2564	2500	3000	5,780	0	0	0	0	0	0	1	2	3	4	13,864	10	4	33,704	30	1,009	944	$5,988	$14,700

	PRESENT YEAR:		1991				FORECASTING MODULE FOR YEAR:				1992																COST	EQUIP.
						O & M COSTS FOR THE YEAR:														SUM	SUM		SUM	SUM			NEXT	COST
UNIT #	EQUIP. CLASS	MODEL	1983	1984	1985	1986	1987	1988	1989	1990	1991	X1	X2	X3	X4	X5	X6	X7	X8	X9	Y's	X's	#	XY's	X2	COEFF.	CONST.	YEAR	NEW
210	8421 1/2 Ton Pickup	1988						7,290	7,167	11,100	2,900	0	0	0	0	0	1	2	3	4	28,477	10	4	66,564	30	(928)	9,434	$4,805	$14,700
210	8439 1/2 Ton Pickup	1988						2,879	2,640	4,537	7,620	0	0	0	0	0	1	2	3	4	17,676	10	4	52,650	30	1,592	469	$8,449	$14,700
210	6291 1/2 Ton Pickup	1986					4,584	11,043	11,708	8,015	11,160	0	0	0	0	1	2	3	4	5	46,510	15	5	149,654	55	1,012	6,265	$12,339	$14,700
210	6239 1/2 Ton Pickup	1986					3,337	7,089	7,612	5,825	5,900	0	0	0	0	1	2	3	4	5	29,763	15	5	93,251	55	390	4,786	$7,127	$14,700
210	6227 1/2 Ton Pickup	1986					4,853	14,230	12,640	9,274	9,190	0	0	0	0	1	2	3	4	5	50,187	15	5	154,279	55	372	8,922	$11,153	$14,700
210	6235 1/2 Ton Pickup	1986					3,950	8,656	8,147	8,520	5,644	0	0	0	0	1	2	3	4	5	34,917	15	5	108,003	55	325	6,008	$7,959	$14,700
210	7050 1/2 Ton Pickup	1987					2,306	7,942	2,325	6,501	5,466	0	0	0	0	1	2	3	4	5	30,542	15	5	96,509	55	468	4,644	$7,573	$14,700
210	7058 1/2 Ton Pickup	1987					2,061	2,040	1,870	3,554	5,050	0	0	0	0	1	2	3	4	5	17,575	15	5	66,217	55	1,349	(533)	$7,563	$14,700
210	7092 1/2 Ton Pickup	1987					1,749	3,560	3,591	5,310	569	0	0	0	0	1	2	3	4	5	14,779	15	5	43,727	55	(61)	3,139	$2,773	$14,700
210	7100 1/2 Ton Pickup	1987					2,221	13,560	13,667	8,824	11,400	0	0	0	0	1	2	3	4	5	49,672	15	5	162,638	55	1,362	5,848	$14,021	$14,700
210	7118 1/2 Ton Pickup	1987					2,484	6,454	6,158	6,895	12,972	0	0	0	0	1	2	3	4	5	34,943	15	5	126,266	55	2,144	556	$13,420	$14,700
210	7126 1/2 Ton Pickup	1987					6,662	2,480	2,856	5,350	12,170	0	0	0	0	1	2	3	4	5	29,518	15	5	102,440	55	1,369	1,736	$10,069	$14,700
210	7134 1/2 Ton Pickup	1987					1,420	6,953	6,523	2,465	3,155	0	0	0	0	1	2	3	4	5	19,916	15	5	59,330	55	(42)	4,109	$3,858	$14,700
210	7142 1/2 Ton Pickup	1987					1,799	6,940	7,005	5,960	10,086	0	0	0	0	1	2	3	4	5	31,790	15	5	110,964	55	1,559	1,680	$11,036	$14,700
210	7159 1/2 Ton Pickup	1987					2,297	7,120	7,735	6,960	8,119	0	0	0	0	1	2	3	4	5	32,191	15	5	108,017	55	1,144	3,005	$9,871	$14,700
210	7167 1/2 Ton Pickup	1987					1,968	6,159	9,037	8,870	5,420	0	0	0	0	1	2	3	4	5	31,454	15	5	103,977	55	962	3,406	$9,175	$14,700
210	7175 1/2 Ton Pickup	1987					3,767	5,100	5,349	7,820	5,475	0	0	0	0	1	2	3	4	5	27,511	15	5	88,669	55	614	3,861	$7,343	$14,700
210	7183 1/2 Ton Pickup	1987					1,971	7,727	8,894	6,760	9,486	0	0	0	0	1	2	3	4	5	36,858	15	5	126,657	55	1,606	2,547	$12,197	$14,700
110	9099 1/2 Ton Pickup	1989										0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	$0	$14,700
210	139 1/2 Ton Pickup	1990								200	2,036	0	0	0	0	0	0	0	1	2	2,236	3	2	4,272	5	1,836	(1,836)	$3,672	$14,700
210	147 1/2 Ton Pickup	1990								185	1,885	0	0	0	0	0	0	0	1	2	2,070	3	2	3,955	5	1,700	(1,515)	$3,585	$14,700
210	155 1/2 Ton Pickup	1990									1,635	0	0	0	0	0	0	0	0	1	1,635	1	1	1,635	1	0	1,635	$1,635	$14,700
210	238 1/2 Ton Pickup	1990								4,920	3,810	0	0	0	0	0	0	0	1	2	8,730	3	2	12,540	5	(1,110)	6,030	$2,700	$14,700
210	246 1/2 Ton Pickup	1990								5,510	7,093	0	0	0	0	0	0	0	1	2	12,603	3	2	19,696	5	1,583	3,927	$8,676	$14,700
210	253 1/2 Ton Pickup	1990								4,950	3,586	0	0	0	0	0	0	0	1	2	8,536	3	2	12,122	5	(1,364)	6,314	$2,222	$14,700
210	261 1/2 Ton Pickup	1990								5,415	7,245	0	0	0	0	0	0	0	1	2	12,660	3	2	19,905	5	1,830	3,585	$9,075	$14,700
210	276 1/2 Ton Pickup	1990								3,540	3,805	0	0	0	0	0	0	0	1	2	7,345	3	2	11,150	5	265	3,275	$4,070	$14,700
210	1152 1/2 Ton Pickup	1991										0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	$0	$14,700
111	8512 One Ton Truck	1988						3,605	3,750	9,760	7,210	0	0	0	0	0	1	2	3	4	24,325	10	4	69,225	30	1,663	1,875	$10,285	$20,400
111	8538 One Ton Truck	1988						7,340	7,983	7,270	6,817	0	0	0	0	0	1	2	3	4	29,410	10	4	72,384	30	(228)	7,923	$8,782	$20,400
111	5286 One Ton Truck	1985		1,555	6,284	6,552	13,934	15,599	11,150	21,379	0	0	1	2	3	4	5	6	7	78,453	28	7	390,063	140	2,723	315	$22,101	$20,400
111	5294 One Ton Truck	1985		3,179	7,832	7,759	15,029	14,663	12,300	11,010	0	0	1	2	3	4	5	6	7	71,772	28	7	326,421	140	1,405	4,634	$15,872	$20,400
111	6342 One Ton Truck	1986				3,246	8,468	9,296	14,890	5,553	0	0	0	0	0	1	2	3	4	5	41,455	15	5	135,397	55	1,103	4,981	$11,801	$20,400
111	6359 One Ton Truck	1986				8,896	8,775	8,456	7,960	10,089	0	0	0	0	0	1	2	3	4	5	44,176	15	5	134,101	55	157	8,366	$9,306	$20,400
111	6367 One Ton Truck	1986				6,320	7,457	7,874	13,120	15,817	0	0	0	0	0	1	2	3	4	5	50,588	15	5	176,421	55	2,456	2,721	$17,515	$20,400
211	6259 One Ton Truck	1986				2,758	9,760	10,444	6,085	14,025	0	0	0	0	0	1	2	3	4	5	43,072	15	5	148,075	55	1,886	2,957	$14,272	$20,400
211	7018 One Ton Truck	1987				3,259	2,182	2,483	8,802	4,704	0	0	0	0	0	1	2	3	4	5	21,430	15	5	73,800	55	951	1,433	$7,139	$20,400
211	7026 One Ton Truck	1987				3,882	4,671	4,198	4,415	12,425	0	0	0	0	0	1	2	3	4	5	29,592	15	5	105,508	55	1,583	869	$10,968	$20,400
211	8487 One Ton Truck	1988					8,769	9,814	20,348	20,628	0	0	0	0	0	0	1	2	3	4	59,559	10	4	171,953	30	4,611	3,362	$28,418	$20,400
211	8503 One Ton Truck	1988					7,486	7,698	11,365	16,143	0	0	0	0	0	0	1	2	3	4	42,692	10	4	121,549	30	2,964	3,264	$18,083	$20,400
211	9300 One Ton Truck	1989						966	3,544	6,244	0	0	0	0	0	0	0	1	2	3	10,754	6	3	26,786	14	2,639	(1,893)	$8,663	$20,400
211	8495 One Ton Truck	1988					8,578	7,448	9,670	18,823	0	0	0	0	0	0	1	2	3	4	44,517	10	4	127,774	30	3,296	2,669	$18,370	$20,400
211	7190 One Ton Truck	1987					11,656	11,725	10,420	10,990	0	0	0	0	0	0	1	2	3	4	44,791	10	4	110,326	30	(330)	12,024	$10,372	$20,400
211	13 One Ton Truck	1990							7,820	5,265	0	0	0	0	0	0	0	0	1	2	12,885	3	2	18,150	5	(2,355)	9,575	$2,910	$20,400
211	54 One Ton Truck	1990								2,370	0	0	0	0	0	0	0	0	0	1	2,370	1	1	2,370	1	0	2,370	$2,370	$20,400
211	332 One Ton Truck	1990								3,630	0	0	0	0	0	0	0	0	0	1	3,630	1	1	3,630	1	0	3,630	$3,630	$20,400
211	9212 One Ton Truck	1989							1,974	6,530	0	0	0	0	0	0	0	0	1	2	8,504	3	2	15,034	5	4,556	(2,582)	$11,086	$20,400
311	1168 One Ton Truck	1991									4,362	0	0	0	0	0	0	0	0	1	4,362	1	1	4,362	1	0	4,362	$4,362	$20,400
111	8520 One Ton Truck	1988						19,831	20,930	19,058	11,410	0	0	0	0	0	1	2	3	4	71,229	10	4	164,505	30	(2,714)	24,591	$11,024	$20,400

	PRESENT YEAR:		1991				FORECASTING MODULE FOR YEAR:			1992															COST	EQUIP.
					D & M COSTS FOR THE YEAR:																SUM	SUM		SUM	SUM			NEXT	COST
UNIT #	EQUIP. CLASS	MODEL	1983	1984	1985	1986	1987	1988	1989	1990	1991	X1	X2	X3	X4	X5	X6	X7	X8	X9	Y's	X's	#	XY's	X2	COEFF.	CONST.	YEAR	NEW
211	1177 Utility Truck	1991									8,999	0	0	0	0	0	0	0	0	1	8,999	1	1	8,999	1	0	8,999	$8,999	$20,400
112	6783 VAN	1988						2,488	2,366	4,210	6,842	0	0	0	0	0	1	2	3	4	18,928	10	4	48,456	30	1,405	560	$7,703	$17,500
112	5244 VAN	1985			5,054	9,406	5,884	11,240	12,685	11,545	10,396	0	0	1	2	3	4	5	6	7	66,213	28	7	291,966	140	966	5,586	$13,332	$17,500
212	6167 VAN	1986					2,588	7,903	6,713	8,691	9,599	0	0	0	1	2	3	4	5	6	37,894	21	5	154,986	91	2,265	(1,168)	$11,227	$17,500
212	6175 VAN	1986					1,236	8,027	8,515	10,910	6,582	0	0	0	1	2	3	4	5	6	35,250	21	5	154,535	91	2,316	(2,673)	$11,219	$17,500
212	6233 VAN	1986				1,156	4,170	4,270	3,268	6,730	4,552	0	0	1	2	3	4	5	6	7	24,146	28	6	120,486	140	606	122	$5,976	$17,500
212	6577 VAN	1988						319	5,441	764	5,311	0	0	0	0	0	1	2	3	4	11,835	10	4	34,737	30	1,030	384	$5,534	$17,500
312	8543 VAN	1988						2,640	2,287	6,383	11,951	0	0	0	0	0	1	2	3	4	23,261	10	4	74,187	30	3,033	(2,192)	$13,823	$17,500
112	96 VAN	1990								340	4,043	0	0	0	0	0	0	0	1	2	4,383	3	2	8,426	5	3,703	(3,360)	$7,746	$17,500
112	104 VAN	1990								520	3,689	0	0	0	0	0	0	0	1	2	4,209	3	2	7,898	5	3,169	(2,849)	$6,858	$17,500
112	112 VAN	1990								215	2,781	0	0	0	0	0	0	0	1	2	2,996	3	2	5,777	5	2,586	(2,351)	$5,347	$17,500
212	46 VAN	1990								1,040	4,766	0	0	0	0	0	0	0	1	2	5,806	3	2	10,572	5	3,725	(2,666)	$8,492	$17,500
212	81 VAN	1990								417	876	0	0	0	0	0	0	0	1	2	1,293	3	2	2,169	5	459	(42)	$1,335	$17,500
212	79 VAN	1990								924	1,420	0	0	0	0	0	0	0	1	2	2,344	3	2	3,764	5	496	428	$1,916	$17,500
212	87 VAN	1990								602	1,380	0	0	0	0	0	0	0	1	2	1,982	3	2	3,362	5	778	(176)	$2,156	$17,500
212	285 VAN	1990								2,221	4,581	0	0	0	0	0	0	0	1	2	6,802	3	2	11,383	5	2,360	(139)	$6,941	$17,500
212	293 VAN	1990								3,207	3,807	0	0	0	0	0	0	0	1	2	7,014	3	2	10,821	5	690	2,807	$4,407	$17,500
312	1239 VAN	1991									4,780	0	0	0	0	0	0	0	0	1	4,780	1	1	4,780	1	0	4,780	$4,780	$17,500
312	1217 VAN	1991									1,425	0	0	0	0	0	0	0	0	1	1,425	1	1	1,425	1	0	1,425	$1,425	$17,500
312	1365 VAN	1991									451	0	0	0	0	0	0	0	0	1	451	1	1	451	1	0	451	$451	$17,500
114	5065 Small Pick-up	1985			1,021	1,584	2,187	8,804	9,179	5,520	3,942	0	0	1	2	3	4	5	6	7	33,358	28	7	158,550	140	868	1,534	$7,967	$14,900
114	8154 Small Pick-up	1988						2,700	2,500	4,795	5,599	0	0	0	0	0	1	2	3	4	15,834	10	4	44,901	30	1,952	1,301	$6,817	$14,900
114	8378 Small Pick-up	1988						1,392	1,272	2,160	9,598	0	0	0	0	0	1	2	3	4	14,722	10	4	52,008	30	2,641	(2,062)	$10,282	$14,900
214	9839 Small Pick-up	1989							1,858	1,910	3,502	0	0	0	0	0	0	1	2	3	7,270	6	3	18,184	14	852	779	$4,967	$14,900
114	334 Small Pick-up	1990								1,760	716	0	0	0	0	0	0	0	1	2	2,498	3	2	3,216	5	(1,982)	2,842	($344)	$14,900
214	28 Small Pick-up	1990								606	1,002	0	0	0	0	0	0	0	1	2	1,608	3	2	2,810	5	396	210	$1,398	$14,900
214	36 Small Pick-up	1990								833	1,508	0	0	0	0	0	0	0	1	2	2,341	3	2	3,849	5	675	158	$2,180	$14,900
109	5205 Hoist Truck	1985				8413	10,809	15,821	17,480	13,670	8,745	1	2	3	4	5	6	7	8	9	232,848	45	6	527,371	255	23,219	(135,331)	$27,198	$68,400
109	5236 Hoist Truck	1985				8,982	11,299	14,380	14,450	7,553	12,140	0	0	0	1	2	3	4	5	6	87,881	21	6	242,196	91	353	10,382	$12,235	$68,400
420	2965 Hoist Truck	1982	2,252	2,927	6,832	8,888	11,255	10,900	13,023	17,940	15,157	1	2	3	4	5	6	7	8	9	89,894	45	9	559,523	285	1,854	817	$19,159	$68,400
124	3492 25 Yd Collectomatic	1983		9,219	21,375	25,888	25,224	32,810	30,749	22,930	32,305	0	1	2	3	4	5	6	7	8	199,800	36	8	894,023	224	2,290	14,805	$35,145	$146,200
424	5098 25 Yd Collectomatic	1985			8,833	22,514	21,827	41,040	38,364	41,250	39,520	0	0	1	2	3	4	5	6	7	213,548	28	7	1,000,462	140	5,224	9,611	$51,403	$146,200
424	6047 25 Yd Collectomatic	1986					11,470	28,752	34,289	32,240	41,520	0	0	0	0	1	2	3	4	5	148,272	15	5	508,400	55	6,359	10,579	$48,730	$146,200
424	6054 25 Yd Collectomatic	1986					13,931	28,960	26,704	38,115	33,800	0	0	0	0	1	2	3	4	5	139,510	15	5	469,423	55	5,089	12,604	$43,170	$146,200
424	6278 25 Yd Collectomatic	1986					21,622	44,795	38,804	44,105	31,198	0	0	0	0	1	2	3	4	5	180,524	15	5	560,034	55	1,845	30,566	$41,843	$146,200
424	7037 25 Yd Collectomatic	1987						35,015	37,322	25,810	36,120	0	0	0	0	0	1	2	3	4	134,267	10	4	331,569	30	(629)	35,616	$31,518	$146,200
424	7094 25 Yd Collectomatic	1987						38,420	38,275	36,200	48,533	0	0	0	0	0	1	2	3	4	159,428	10	4	415,702	30	3,452	31,291	$48,423	$146,200
424	7102 25 Yd Collectomatic	1987						30,890	36,184	44,720	60,314	0	0	0	0	0	1	2	3	4	172,108	10	4	478,674	30	9,981	16,825	$57,229	$146,200
424	7110 25 Yd Collectomatic	1987						38,409	37,900	44,305	45,091	0	0	0	0	0	1	2	3	4	163,705	10	4	425,488	30	3,245	32,814	$49,039	$146,200
424	7128 25 Yd Collectomatic	1987						34,764	37,850	39,455	43,510	0	0	0	0	0	1	2	3	4	155,579	10	4	402,869	30	2,784	31,934	$45,858	$146,200
424	7144 25 Yd Collectomatic	1987						35,500	37,805	33,105	61,508	0	0	0	0	0	1	2	3	4	167,918	10	4	456,457	30	7,332	23,849	$60,311	$146,200
424	5509 25 Yd Collectomatic	1985						46,241	45,450	45,785	51,178	0	0	0	0	0	1	2	3	4	188,654	10	4	479,208	30	1,515	43,377	$50,950	$146,200
424	8811 25 Yd Collectomatic	1988						14,508	17,700	19,908	44,964	0	0	0	0	0	1	2	3	4	97,180	10	4	269,566	30	9,322	976	$47,814	$146,200
424	8829 25 Yd Collectomatic	1988						12,131	14,625	22,645	37,158	0	0	0	0	0	1	2	3	4	86,559	10	4	257,948	30	8,310	864	$42,415	$146,200
426	1020 25 Yd Collectomatic	1991									7,179	0	0	0	0	0	0	0	0	1	7,179	1	1	7,179	1	0	7,179	$7,179	$146,200
426	1038 25 Yd Collectomatic	1991									7,982	0	0	0	0	0	0	0	0	1	7,982	1	1	7,982	1	0	7,982	$7,982	$146,200
426	1111 25 Yd Collectomatic	1991									3,480	0	0	0	0	0	0	0	0	1	3,480	1	1	3,480	1	0	3,480	$3,480	$146,200

	PRESENT YEAR:		1991	FORECASTING MODULE FOR YEAR:						1992																	COST	EQUIP.
				O & M COSTS FOR THE YEAR:																							NEXT	COST
UNIT #	EQUIP. CLASS	MODEL	1983	1984	1985	1986	1987	1988	1989	1990	1991	X1	X2	X3	X4	X5	X6	X7	X8	X9	SUM Y's	SUM X's	#	SUM XY's	SUM X2	COEFF.	CONST.	YEAR	NEW
125	3483 16 Yd collectomatic	1983		6,077	16,910	28,918	28,328	30,895	32,945	32,520	44,760	0	1	2	3	4	5	6	7	8	269,075	36	9	1,099,146	204	3,791	6,173	$43,096	$97,600
425	2524 16 Yd collectomatic	1982	8,563	21,401	24,581	23,639	29,182	37,820	56,829	28,045	19,640	1	2	3	4	5	6	7	8	9	252,730	45	9	1,448,447	285	2,247	17,959	$40,425	$97,600
425	2532 16 Yd collectomatic	1982	13,720	20,017	49,736	32,228	34,160	22,065	24,960	33,915	31,605	1	2	3	4	5	6	7	8	9	253,257	45	9	1,259,078	285	379	25,246	$30,026	$97,600
425	5105 16 Yd collectomatic	1985			12,019	18,281	24,941	25,632	27,500	35,840	24,708	0	0	1	2	3	4	5	6	7	169,721	28	7	757,028	140	2,791	13,082	$35,409	$97,600
428	6290 Water Tanker	1986				11,235	13,208	29,934	34,945	25,067	35,912	0	0	0	1	2	3	4	5	6	149,421	21	6	664,540	91	4,886	8,590	$41,217	$52,900
237	8644 Compact Cars	1988							2,462	1,740	1,200	0	0	0	0	0	0	0	1	2	3	5,372	6	3	10,002	14	(571)	2,999	$715	$14,000
137	5310 Compact Cars	1985				1,058	2,048	6,694	3,830	5,420	3,252	0	0	0	1	2	3	4	5	6	22,353	21	6	87,270	91	516	1,919	$5,532	$14,000
237	1102 Compact Cars	1991									2,065																		$14,000
237	5111 Compact Cars	1985						1,484	900	2,840	9,620	1,480	0	0	0	0	1	2	3	4	5	18,304	15	5	57,584	55	867	659	$5,862	$14,000
237	5129 Compact Cars	1985						3,598	5,198	7,582	9,740	11,477	0	0	0	0	1	2	3	4	5	37,595	15	5	133,085	55	2,039	1,429	$13,609	$14,000
237	5137 Compact Cars	1985						2,189	4,174	3,799	1,345	3,965	0	0	0	0	1	2	3	4	5	15,472	15	5	47,139	55	72	2,878	$3,311	$14,000
237	5145 Compact Cars	1985						1,391	9,085	9,212	7,180	8,553	0	0	0	0	1	2	3	4	5	35,421	15	5	118,682	55	1,242	3,359	$10,810	$14,000
237	7042 Compact Cars	1987						1,021	1,829	2,116	3,220	6,144	0	0	0	0	1	2	3	4	5	14,380	15	5	54,677	55	1,154	(585)	$8,337	$14,000
237	8651 Compact Cars	1988							783	2,462	3,470	1,037	0	0	0	0	0	1	2	3	4	7,772	10	4	20,345	30	183	1,486	$2,401	$14,000
237	9669 Compact Cars	1988							708	717	1,480	1,347	0	0	0	0	0	1	2	3	4	4,252	10	4	11,970	30	268	393	$1,733	$14,000
237	8677 Compact Cars	1988							802	684	475	1,460	0	0	0	0	0	1	2	3	4	3,421	10	4	9,435	30	177	414	$1,297	$14,000
237	8685 Compact Cars	1988							579	759	767	951	0	0	0	0	0	1	2	3	4	3,656	10	4	8,202	30	112	403	$1,045	$14,000
237	8701 Compact Cars	1988							1,000	944	1,824	1,734	0	0	0	0	0	1	2	3	4	5,702	10	4	15,296	30	306	605	$2,146	$14,000
237	8719 Compact Cars	1986							530	508	1,055	810	0	0	0	0	0	1	2	3	4	2,883	10	4	7,891	30	157	379	$1,063	$14,000
237	8727 Compact Cars	1988							457	460	662	1,639	0	0	0	0	0	1	2	3	4	3,198	10	4	9,809	30	365	(108)	$1,707	$14,000
237	8735 Compact Cars	1988							485	473	1,194	1,503	0	0	0	0	0	1	2	3	4	3,656	10	4	11,005	30	377	(29)	$1,857	$14,000
237	8743 Compact Cars	1988							366	2,248	2,505	1,480	0	0	0	0	0	1	2	3	4	6,599	10	4	17,977	30	336	790	$2,470	$14,000
237	8750 Compact Cars	1988							2,444	2,385	968	749	0	0	0	0	0	1	2	3	4	6,552	10	4	18,122	30	(652)	3,284	$11	$14,000
237	8768 Compact Cars	1988							879	883	2,067	2,321	0	0	0	0	0	1	2	3	4	6,150	10	4	18,130	30	552	160	$2,915	$14,000
237	8776 Compact Cars	1988							280	328	1,668	979	0	0	0	0	0	1	2	3	4	2,875	10	4	8,716	30	256	105	$1,363	$14,000
237	9147 Compact Cars	1989								83	947	1,207	0	0	0	0	0	0	1	2	3	2,237	6	3	6,898	14	812	(745)	$2,503	$14,000
237	9154 Compact Cars	1989								18	658	1,054	0	0	0	0	0	0	1	2	3	1,710	6	3	4,436	14	509	(446)	$1,586	$14,000
237	9162 Compact Cars	1989									259	1,291	0	0	0	0	0	0	0	1	2	1,551	3	2	2,912	5	1,031	(781)	$2,312	$14,000
237	9170 Compact Cars	1989									1,496	1,291	0	0	0	0	0	0	0	1	2	2,787	3	2	4,078	5	(265)	1,701	$1,986	$14,000
237	1102 Compact Cars	1991											0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	$0	$14,000
146	8651 Street Broom	1978	12,349	27,740	22,889	34,852	33,000	43,204	41,133	27,240	36,700	1	2	3	4	5	6	7	8	9	282,107	45	9	1,539,279	285	2,312	19,581	$42,985	$154,000
146	8586 Street broom	1988						27,705	32,500	45,325	84,016	0	0	0	0	0	0	1	2	3	4	189,569	10	4	484,973	30	12,166	12,017	$72,918	$154,000
546	6305 Street Broom	1986				14,139	26,359	33,742	36,377	41,525	41,025	0	0	0	1	2	3	4	5	6	193,147	21	6	767,266	91	5,214	13,941	$50,441	$154,000
252	2134 Large Backhoe	1991										0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	$0	$188,000
354	7060 Small Backhoe	1987							8,340	8,345	15,940	14,220	0	0	0	0	0	1	2	3	4	46,825	10	4	129,650	30	2,516	5,413	$18,000	$65,000
354	8690 Small Backhoe	1988							6,030	8,118	11,547	20,936	0	0	0	0	0	1	2	3	4	44,631	10	4	136,651	30	5,015	(1,379)	$23,695	$65,000
466	5709 Gang Mower	1985		782	2,237	2,840	1,544	1,905	1,960	1,060	2,520	0	1	2	3	4	5	6	7	8	14,828	36	8	68,197	204	56	1,574	$2,983	$33,000
466	7275 Gang Mower	1977	1,939	1,582	3,496	1,867	2,035	2,405	2,654	2,417	10,063	1	2	3	4	5	6	7	8	9	29,478	45	9	176,225	285	564	345	$5,984	$33,000
160	2048 Gang Mower	1982	1,389	8,048	8,810	7,503	2,795	2,017	863	621	4,760	1	2	3	4	5	6	7	8	9	36,826	45	9	153,993	285	(502)	6,603	$1,560	$33,000
366	4026 ang Mower	1984		27	655	1,717	2,587	1,372	2,194	3,670	2,350	0	1	2	3	4	5	6	7	8	14,572	36	8	81,350	204	376	131	$3,512	$33,000
366	4034 Gang Mower	1984		54	1,245	937	1,365	2,282	2,317	1,702	3,843	0	1	2	3	4	5	6	7	8	13,745	36	8	78,765	204	402	(94)	$3,530	$33,000
366	6138 Gang Mower	1986				733	3,742	2,492	2,821	2,572	2,795	0	0	0	1	2	3	4	5	6	15,155	21	6	56,607	91	204	1,813	$3,239	$33,000
366	8146 Gang Mower	1986				494	1,917	4,477	3,204	2,919	4,045	0	0	0	1	2	3	4	5	6	17,067	21	6	69,566	91	552	696	$4,800	$33,000
466	9099 Gang Mower	1979	4,265	669	343	4,394	3,055	5,539	5,339	2,660	5,159	1	2	3	4	5	6	7	8	9	31,473	45	9	178,052	285	346	1,773	$5,221	$33,000
466	9107 Gang Mower	1979	990	1,509	692	225	1,699	1,495	1,229	2,166	1,556	1	2	3	4	5	6	7	8	9	11,761	45	9	65,484	285	111	750	$1,963	$33,000

PRESENT YEAR: 1991 FORECASTING MODULE FOR YEAR: 1992

O & M COSTS FOR THE YEAR:

UNIT #	EQUIP CLASS	MODEL	1983	1984	1985	1986	1987	1988	1989	1990	1991	X1	X2	X3	X4	X5	X6	X7	X8	X9	SUM Y's	SUM X's	#	SUM YY's	SUM X2	COEFF.	CONST.	COST NEXT YEAR	EQUIP. COST : BM
915	33 Gang Mower	1980	2,979	1,320	1,235	4,435	1,551	1,741	1,765	564	1,950	1	2	3	4	5	6	7	8	9	17,520	45	9	78,482	285	(139)	2,823	$1,270	$33,000
766	3048 Gang Mower	1983		28	50	90	306	1,884	2,057	2,220	4,375	0	1	2	3	4	5	6	7	8	10,790	36	8	72,424	204	560	(1,209)	$3,966	$33,000
701	3073 Gang Mower	1983		3,322	2,710	1,354	1,167	822	1,080	1,231	1,884	0	1	2	3	4	5	6	7	8	14,200	36	8	53,641	204	(944)	2,674	$676	$33,000
166	6805 Gang Mower	1988						3,775	3,550	1,353	9,532	0	0	0	0	0	1	2	3	4	18,210	10	4	53,482	30	1,537	734	$8,421	$33,000
177	6897 Blower Attachment	1976	1,259	304	569	28,112	32,653	7,865	7,815	3,230	1,657	1	2	3	4	5	6	7	8	9	83,474	45	9	421,545	285	78	8,854	$9,656	$114,000
377	5863 Blower Attachment	1975	1,112	3,756	4,373	4,655	17,255	17,490	15,632	3,640	14,200	1	2	3	4	5	6	7	8	9	82,143	45	9	498,072	285	1,456	1,847	$16,407	$114,000
377	5899 Blower Attachment	1975	8,991	473	5,225	4,246	8,824	19,042	14,550	4,460	8,550	1	2	3	4	5	6	7	8	9	74,361	45	9	415,448	285	727	4,625	$11,899	$114,000
377	9188 Blower Attachment	1979	5,596	3,233	8,446	13,038	24,070	34,209	34,220	4,120	15,230	1	2	3	4	5	6	7	8	9	142,164	45	9	924,728	285	1,893	6,304	$25,288	$114,000
377	146 Blower Attachment	1980	3,766	3,050	4,617	4,122	21,466	26,003	26,650	7,348	9,739	1	2	3	4	5	6	7	8	9	106,813	45	9	636,818	285	1,713	3,305	$20,431	$114,000
277	5914 Blower Attachment	1965	7,495	575	5,396	3,843	16,056	30,800	38,430	25,260	14,329	1	2	3	4	5	6	7	8	9	142,185	45	9	905,346	285	3,240	(403)	$32,000	$114,000
277	5922 Blower Attachment	1965	6,032	2,630	8,726	16,054	24,114	48,643	45,550	17,700	12,240	1	2	3	4	5	6	7	8	9	191,757	45	9	1,084,802	285	2,934	5,527	$34,863	$114,000
277	5930 Blower Attachment	1965	1,829	939	8,896	10,536	24,493	26,215	25,500	18,115	16,829	1	2	3	4	5	6	7	8	9	133,352	45	9	827,175	285	2,674	1,449	$28,185	$114,000
577	9329 Blower Attachment	1989							21,693	10,400	28,400	0	0	0	0	0	0	0	1	2	3	60,493	6	3	127,693	14	3,354	13,457	$26,871	$114,000
577	9335 Blower Attachment	1989							13,700	19,653	13,100	0	0	0	0	0	0	0	1	2	3	46,450	6	3	92,300	14	(300)	16,033	$14,883	$114,000
577	9343 Blower Attachment	1989							10,640	25,015	22,240	0	0	0	0	0	0	1	2	3	57,895	6	3	127,890	14	5,800	7,898	$30,898	$114,000
577	9350 Blower Attachment	1989							24,300	9,505	16,200	0	0	0	0	0	0	0	1	2	3	52,005	6	3	97,910	14	(3,050)	23,435	$11,235	$114,000
202	2101 Loader/Snwblwr – fixe	1982	28,420	4,636	7,420	17,552	43,272	35,421	38,900	32,415	25,405	1	2	3	4	5	6	7	8	9	233,441	45	9	1,319,311	285	2,536	13,262	$38,613	$239,000
202	2119 Loader/Snwblwr – fixe	1982	18,239	7,827	13,554	15,977	44,727	28,010	31,700	30,059	28,556	1	2	3	4	5	6	7	8	9	219,643	45	9	1,256,529	285	2,671	11,045	$37,764	$239,000
218	5114 Compressor – Mounti	1985			3,432	6,377	9,486	12,023	10,195	11,535	12,766	0	0	1	2	3	4	5	6	7	66,916	28	7	386,999	140	1,491	3,956	$15,163	$25,000
218	5122 Compressor – Mounti	1985			2,149	3,830	5,796	8,913	8,825	7,336	12,553	0	0	1	2	3	4	5	6	7	49,502	28	7	239,361	140	1,477	1,164	$12,979	$25,000
218	1188 Compressor – Mounti	1991									5,565	0	0	0	0	0	0	0	0	1	5,565	1	1	5,565	1	0	5,565	$5,565	$25,000
218	1196 Compressor – Mounti	1991									10,452	0	0	0	0	0	0	0	0	1	10,452	1	1	10,452	1	0	10,452	$10,452	$25,000
652	9228 Small Sweeper	1989							125	3,344	2,819	0	0	0	0	0	0	0	1	2	3	6,288	6	3	15,270	14	1,345	(638)	$4,790	$39,000
257	4044 Large Roller	1974	4,755	4,147	1,128	5,871	5,459	3,570	3,480	9,250	1,650	1	2	3	4	5	6	7	8	9	39,343	45	9	230,226	285	59	4,089	$4,853	$105,000
367	2543 Small Dozer	1982	2,846	24,729	7,573	17,822	888	4,655	1,092	1,250	5,548	1	2	3	4	5	6	7	8	9	66,998	45	9	253,432	285	(1,359)	14,241	$848	$95,000
331	9084 Pothole Patcher	1989							2,845	10,090	9,614	0	0	0	0	0	0	0	1	2	3	21,949	6	3	51,567	14	3,881	(453)	$15,285	$92,400
431	3474 Pothole Patcher	1983		4,711	9,939	10,671	20,244	9,791	8,355	13,467	21,630	0	1	2	3	4	5	6	7	8	99,808	36	8	506,972	204	1,442	5,958	$18,994	$92,400
416	9025 5 Ton Dump Truck	1989							9,004	16,946	22,290	0	0	0	0	0	0	0	1	2	3	48,240	6	3	109,786	14	6,643	2,784	$25,366	$95,000
416	9033 5 Ton Dump Truck	1989							11,600	24,100	45,034	0	0	0	0	0	0	0	1	2	3	80,734	6	3	194,902	14	16,711	(6,523)	$60,345	$95,000
416	9041 5 Ton Dump Truck	1989							6,823	16,155	23,291	0	0	0	0	0	0	0	1	2	3	46,269	6	3	109,006	14	8,234	(1,045)	$31,891	$95,000
416	9058 5 Ton Dump Truck	1989							4,365	20,845	24,813	0	0	0	0	0	0	0	1	2	3	49,023	6	3	118,234	14	10,124	(3,907)	$36,589	$95,000
416	9066 5 Ton Dump Truck	1989							4,420	21,340	30,985	0	0	0	0	0	0	0	1	2	3	56,745	6	3	140,055	14	13,285	(7,650)	$45,480	$95,000
416	9074 5 Ton Dump Truck	1988						4,700	6,495	25,660	36,912	0	0	0	0	0	1	2	3	4	73,770	10	4	242,321	30	11,579	(10,506)	$47,291	$95,000
416	2442 5 Ton Dump Truck	1982	5370	6,842	11,256	22,948	9,707	14,760	10,768	16,948	9,075	1	2	3	4	5	6	7	8	9	107,675	45	9	574,331	285	596	8,968	$14,960	$95,000
416	3077 5 Ton Dump Truck	1983	2,099	4,384	4,070	7,527	25,091	24,831	25,987	16,900	20,678	1	2	3	4	5	6	7	8	9	131,367	45	9	829,637	285	2,882	196	$28,997	$95,000
416	5155 5 Ton Dump Truck	1985				30,855	36,296	52,550	53,428	47,120	33,320	0	0	0	1	2	3	4	5	6	253,567	21	6	610,321	91	1,301	37,694	$46,826	$95,000
416	5163 5 Ton Dump Truck	1985				17,938	27,665	28,200	30,858	25,300	47,514	0	0	0	1	2	3	4	5	6	177,485	21	6	692,924	91	4,096	15,236	$43,926	$95,000
416	5171 5 Ton Dump Truck	1985				23,158	37,729	28,700	31,563	32,500	35,736	0	0	0	1	2	3	4	5	6	189,406	21	6	667,964	91	1,431	26,559	$36,576	$95,000
416	6062 5 Ton Dump Truck	1986					17,245	33,300	25,824	36,330	58,200	0	0	0	0	1	2	3	4	5	170,899	15	5	597,637	55	8,494	8,698	$59,662	$95,000
416	6070 5 Ton Dump Truck	1986					22,900	28,250	25,468	46,320	33,223	0	0	0	0	1	2	3	4	5	156,171	15	5	519,219	55	4,171	12,322	$44,348	$95,000
416	6161 5 Ton Dump Truck	1986				12,059	20,574	40,820	38,558	25,700	45,091	0	0	0	1	2	3	4	5	6	183,802	21	6	734,945	91	5,236	12,306	$48,961	$95,000
416	6179 5 Ton Dump Truck	1986				8,946	23,859	27,043	30,731	31,250	50,173	0	0	0	1	2	3	4	5	6	172,002	21	6	716,005	91	6,626	5,467	$51,807	$95,000

PRESENT YEAR: 1991 FORECASTING MODULE FOR YEAR: 1992

O & M COSTS FOR THE YEAR:

UNIT #	EQUIP. CLASS	MODEL	1983	1984	1985	1986	1987	1988	1989	1990	1991	X1	X2	X3	X4	X5	X6	X7	X8	X9	SUM Y's	SUM X's	#	SUM XY's	SUM X2	COEFF.	CONST.	COST NEXT YEAR	EQUIP. COST NEW
416	6187 5 Ton Dump Truck	1986				7,884	15,195	35,328	35,279	23,540	36,782	0	0	0	1	2	3	4	5	6	154,008	21	6	623,766	91	4,842	8,720	$42,616	$95,000
416	6195 5 Ton Dump Truck	1986				8,400	20,449	45,900	46,661	28,800	52,100	0	0	0	1	2	3	4	5	6	194,310	21	6	790,242	91	6,285	10,354	$54,416	$95,000
416	6203 5 Ton Dump Truck	1986				7,298	14,829	21,650	22,350	23,001	37,524	0	0	0	1	2	3	4	5	6	126,652	21	6	531,455	91	5,036	3,474	$38,743	$95,000
416	6211 5 Ton Dump Truck	1986				10,170	23,657	27,348	28,425	47,360	38,479	0	0	0	1	2	3	4	5	6	176,059	21	6	724,002	91	6,160	7,784	$50,902	$95,000
416	6245 5 Ton Dump Truck	1986					7,961	15,985	16,260	16,710	29,421	0	0	0	0	1	2	3	4	5	86,337	15	5	302,656	55	4,365	4,174	$30,361	$95,000
416	6252 5 Ton Dump Truck	1986					7,691	13,790	15,445	19,210	19,418	0	0	0	0	1	2	3	4	5	75,664	15	5	255,976	55	2,898	6,438	$23,828	$95,000
416	7078 5 Ton Dump Truck	1987					10,891	26,120	27,478	19,500	37,601	0	0	0	0	1	2	3	4	5	123,590	15	5	415,570	55	4,480	11,270	$38,158	$95,000
416	1066 5 Ton Dump Truck	1991									1304	0	0	0	0	0	0	0	0	1	1,304	1	1	1,304	1	0	1,304	$1,304	$95,000
416	1074 5 Ton Dump Truck	1991									1370	0	0	0	0	0	0	0	0	1	1,370	1	1	1,370	1	0	1,370	$1,370	$95,000
416	1082 5 Ton Dump Truck	1991									2761	0	0	0	0	0	0	0	0	1	2,761	1	1	2,761	1	0	2,761	$2,761	$95,000
416	1090 5 Ton Dump Truck	1991									1118	0	0	0	0	0	0	0	0	1	1,118	1	1	1,118	1	0	1,118	$1,118	$95,000
417	7200 Tandem Dump Truck	1987					21,923	46,450	55,789	45,800	55,820	0	0	0	0	1	2	3	4	5	225,782	15	5	744,490	55	6,714	25,013	$65,300	$132,000
417	7218 Tandem Dump Truck	1987					27,310	61,045	55,116	44,250	62,463	0	0	0	0	1	2	3	4	5	250,184	15	5	804,063	55	5,351	33,984	$66,090	$132,000
417	8448 Tandem Dump Truck	1988						33,800	42,059	40,550	39,889	0	0	0	0	0	0	1	2	3	4	156,298	10	4	399,124	30	1,678	34,885	$43,264	$132,000
422	7013 Sewer Jet	1987						11,190	14,360	18,525	22,020	0	0	0	0	0	0	1	2	3	4	66,095	10	4	183,565	30	3,668	7,360	$25,688	$104,500
501	7611 Grader	1987						28390	32,873	23,990	44,044	0	0	0	0	0	0	1	2	3	4	129,297	10	4	342,282	30	3,808	22,805	$41,844	$120,000
501	9286 Grader	1989							14,376	33,312	38,150	0	0	0	0	0	0	0	1	2	3	85,838	6	3	195,450	14	11,867	4,839	$52,367	$120,000
501	6084 Grader	1986					25,013	46,120	37,863	31,005	24,390	0	0	0	0	1	2	3	4	5	164,391	15	5	476,812	55	(1,638)	37,787	$27,970	$120,000
501	6092 Grader	1986					27,831	42,243	42,039	20,648	27,763	0	0	0	0	1	2	3	4	5	160,524	15	5	459,841	55	(2,173)	38,624	$25,586	$120,000

APPENDIX K

TYPICAL FRAPOF REPLACEMENT MODULE

APPENDIX K EQUIPMENT REPLACEMENT MODULE PRESENT YEAR: 1991

LAST UPDATE: NOV.15/91

UNIT #		EQUIPMENT CLASS	MODEL	COST NEW	ANNUAL OWNERSHIP EQUIPMENT COSTS 1983	1984	1985	1986	1987	1988	1989	1990	1991	FORECAST 1992	ANNUAL EQUIPMENT O&M COSTS 1983	1984	1985	1986	1987	1988	1989	1990	1991	FORECAST 1992	REPLACE EQUIP.? (YES=1; NO=0)
6	9013	Portable Compressor	1989	$20,600	0	0	0	0	0	0	15,000	12,857	10,714	8,571							0	605	2,520	1,524	$2,523	0
6	9021	Portable Compressor	1989	$20,600	0	0	0	0	0	0	15,000	12,857	10,714	8,571								1,160	2,667	2,670	$3,662	0
6	9039	Portable Compressor	1989	$20,600	0	0	0	0	0	0	15,000	12,857	10,714	8,571								840	825	1,820	$1,875	0
6	1101	Portable Compressor	1981	$20,600	5,714	4,571	3,429	2,286	1,143	0	0	0	0	0	825	1,984	2,988	2,964	1,679	2,305	2,470	2,400	2,100	$2,578	1
604	109	Sidewalk Plows	1981	$62,400	23,333	17,500	11,667	5,833	0	0	0	0	0	0	6,012	5,867	16,588	14,169	14,479	15,140	15,060	23,120	12,430	$19,569	1
604	117	Sidewalk Plows	1981	$62,400	23,333	17,500	11,667	5,833	0	0	0	0	0	0	2,748	5,159	10,154	9,175	16,392	15,735	15,760	16,068	9,486	$16,556	1
604	125	Sidewalk Plows	1981	$62,400	23,333	17,500	11,667	5,833	0	0	0	0	0	0	2,128	4,737	13,673	5,343	20,046	14,710	14,699	16,656	15,520	$18,697	1
604	9290	Sidewalk Plows	1989	$62,400	0	0	0	0	0	0	55,000	45,833	36,667	27,500								7,305	6,811	18,845	$22,527	0
74	8194	Sidewalk Plows	1988	$62,400	0	0	0	0	0	52,000	43,333	34,667	26,000	17,333								18,964	19,950	47,450	42,354	$56,597	1
74	8156	Sidewalk Plows	1986	$62,400	0	0	0	48,000	40,000	32,000	24,000	16,000	8,000	0							17,343	19,393	25,150	26,235	14,400	$20,791	1
74	8222	Sidewalk Plows	1986	$62,400	0	0	0	48,000	40,000	32,000	24,000	16,000	8,000	0						5,747	24,819	25,002	22,430	21,233	20,469	$29,245	1
74	7220	Sidewalk Plows	1987	$62,400	0	0	0	0	50,000	41,667	33,333	25,000	16,667	8,333						10,716	22,144	22,013	16,715	15,200	$15,419	1
74	8202	Sidewalk Plows	1988	$62,400	0	0	0	0	0	52,000	43,333	34,667	26,000	17,333							16,990	16,032	23,290	16,200	$19,345	1
74	9184	Sidewalk Plows	1989	$62,400	0	0	0	0	0	0	55,000	45,833	36,667	27,500								8,070	40,435	4,844	$18,624	0
74	9168	Sidewalk Plows	1989	$62,400	0	0	0	0	0	0	55,000	45,833	36,667	27,500								15,900	11,470	20,077	$19,993	0
102	7998	Loader	1987	$160,000	0	0	0	0	118,000	106,167	98,333	88,500	78,667	68,833								16,715	19,121	25,128	21,730	$23,433	0
302	3512	Loader	1973	$160,000	8,500	4,250	0	0	0	0	0	0	0	0	31,302	29,006	35,672	32,331	46,115	22,750	22,364	22,370	22,467	$5,615	1
102	7606	Loader	1987	$160,000	0	0	0	0	118,000	106,167	98,333	88,500	78,667	68,833								16,014	18,129	15,034	22,188	$22,696	0
302	5608	Loader	1975	$160,000	18,333	13,750	9,167	4,583	0	0	0	0	0	0	33,165	12,507	27,402	34,501	40,636	37,724	36,852	12,519	60,123	$44,275	1
402	9359	Loader	1989	$160,000	0	0	0	0	0	0	110,000	100,833	91,667	82,500								7,507	11,390	23,833	$31,899	0
402	9377	Loader	1989	$160,000	0	0	0	0	0	0	110,000	100,833	91,667	82,500								8,725	14,535	23,299	$30,094	0
102	6012	Loader	1986	$160,000	0	0	0	117,000	107,250	97,500	87,750	78,000	68,250	58,500							22,255	39,029	39,400	31,155	32,170	$36,390	0
102	6020	Loader	1986	$160,000	0	0	0	117,000	107,250	97,500	87,750	78,000	68,250	58,500							24,220	41,011	43,639	21,696	32,740	$31,979	0
202	2127	Loader	1981	$160,000	70,833	63,750	56,667	49,583	42,500	35,417	28,333	21,250	14,167	7,083	8,705	19,220	35,365	50,099	54,156	26,800	37,504	36,200	16,250	$36,763	1
202	9163	Loader	1979	$160,000	48,667	42,583	36,500	30,417	24,333	18,250	12,167	6,083	0	0	19,047	23,690	24,516	25,049	31,652	52,200	23,900	19,240	39,700	$38,459	1
302	161	Loader	1980	$160,000	59,250	52,667	46,083	39,500	32,917	26,333	19,750	13,167	6,583	0	21,079	40,021	45,905	59,531	56,748	40,035	39,092	18,072	45,165	$40,353	1
302	5012	Loader	1985	$160,000	0	0	85,000	77,917	70,833	63,750	56,667	49,583	42,500	35,417			9,969	21,013	23,394	37,002	36,154	35,410	47,200	$51,913	1
302	5020	Loader	1985	$160,000	0	0	85,000	77,917	70,833	63,750	56,667	49,583	42,500	35,417			9,106	19,005	25,783	63,332	64,094	36,200	33,479	$57,974	1
402	0442	Loader	1990	$160,000	0	0	0	0	0	0	0	160,000	146,667	133,333									11,700	20,574	$29,448	0
402	0434	Loader	1990	$160,000	0	0	0	0	0	0	0	160,000	146,667	133,333									11,300	27,120	$42,940	0
402	0459	Loader	1990	$160,000	0	0	0	0	0	0	0	160,000	146,667	133,333									8,275	15,200	$22,125	0

UNIT #		EQUIPMENT CLASS	MODEL	COST NEW	ANNUAL OWNERSHIP EQUIPMENT COSTS 1983	1984	1985	1986	1987	1988	1989	FORECAST 1990	1991	1992	ANNUAL EQUIPMENT O&M COSTS 1983	1984	1985	1986	1987	1988	1989	1990	1991	FORECA 19.2	REPLACE EQUIP? (YES=1; NO=0)
110	9206	1/2 Ton Pickup	1989	$14,700	0	0	0	0	0	0	13,800	10,350	6,900	3,450							1,828	2,271	2,507	$3,820	1
110	9214	1/2 Ton Pickup	1989	$14,700	0	0	0	0	0	0	13,800	10,350	6,900	3,450							1,854	2,777	4,302	$7,132	1
110	9222	1/2 Ton Pickup	1989	$14,700	0	0	0	0	0	0	13,800	10,350	6,900	3,450							2,491	3,130	3,983	$5,227	1
110	9230	1/2 Ton Pickup	1989	$14,700	0	0	0	0	0	0	13,800	10,350	6,900	3,450							2,917	3,745	5,851	$8,772	1
110	9246	1/2 Ton Pickup	1989	$14,700	0	0	0	0	0	0	13,800	10,350	6,900	3,450							3,225	4,212	8,932	$11,830	1
110	3399	1/2 Ton Pickup	1983	$14,700	9,000	6,750	4,500	2,250	0	0	0	0	0	0	1,510	1,825	3,255	4,194	3,288	3,514	5,804	7,799	$7,316	1
110	9255	1/2 Ton Pickup	1989	$14,700	0	0	0	0	0	0	13,800	10,350	6,900	3,450							9,715	6,025	5,812	$3,281	0
110	9263	1/2 Ton Pickup	1989	$14,700	0	0	0	0	0	0	13,800	10,350	6,900	3,450							662	2,100	2,908	$4,139	1
110	9271	1/2 Ton Pickup	1989	$14,700	0	0	0	0	0	0	13,800	10,350	6,900	3,450							1,544	3,008	3,784	$5,032	1
110	5030	1/2 Ton Pickup	1985	$14,700	0	0	9,500	7,125	4,750	2,375	0	0	0	0			2,934	4,704	6,318	16,005	15,026	3,530	17,258	$19,004	1
110	5261	1/2 Ton Pickup	1985	$14,700	0	0	9,500	7,125	4,750	2,375	0	0	0	0			2,044	5,122	9,188	8,654	8,156	3,780	11,006	$10,160	1
110	6152	1/2 Ton Pickup	1986	$14,700	0	0	0	10,000	7,500	5,000	2,500	0	0	0				1,929	5,016	6,300	8,724	11,200	15,300	$17,726	1
110	6244	1/2 Ton Pickup	1986	$14,700	0	0	0	10,000	7,500	5,000	2,500	0	0	0				3,271	12,737	9,443	11,148	12,250	3,532	$8,865	1
110	6305	1/2 Ton Pickup	1986	$14,700	0	0	0	10,000	7,500	5,000	2,500	0	0	0					6,662	10,218	11,823	3,043	1,879	$4,203	1
210	8369	1/2 Ton Pickup	1988	$14,700	0	0	0	0	0	14,200	10,650	7,100	3,550	0						4,864	5,174	11,250	5,150	$8,443	1
210	8397	1/2 Ton Pickup	1988	$14,700	0	0	0	0	0	14,200	10,650	7,100	3,550	0						8,965	9,025	4,250	11,259	$9,367	1
210	8405	1/2 Ton Pickup	1988	$14,700	0	0	0	0	0	14,200	10,650	7,100	3,550	0						4,878	4,733	7,877	11,138	$12,638	1
210	8413	1/2 Ton Pickup	1988	$14,700	0	0	0	0	0	14200	10650	7100	3,550	0						2584	2500	3000	5,700	$5,998	1
210	8421	1/2 Ton Pickup	1988	$14,700	0	0	0	0	0	14,200	10,650	7,100	3,550	0						7,200	7,187	11,100	2,900	$4,805	1
210	8439	1/2 Ton Pickup	1988	$14,700	0	0	0	0	0	14,200	10,650	7,100	3,550	0						2,579	2,840	4,537	7,809	$8,446	1
210	3201	1/2 Ton Pickup	1985	$14,700	0	0	0	10,000	7,500	5,000	2,500	0	0	0					4,584	11,043	11,708	4,015	11,552	$12,339	1
210	8219	1/2 Ton Pickup	1985	$14,700	0	0	0	10,000	7,500	5,000	2,500	0	0	0					3,337	7,369	7,812	3,825	5,920	$7,127	1
210	8227	1/2 Ton Pickup	1985	$14,700	0	0	0	10,000	7,500	5,000	2,500	0	0	0					4,853	14,230	12,540	1,274	9,196	$11,153	1
210	8235	1/2 Ton Pickup	1986	$14,700	0	0	0	13,200	9,900	6,600	3,300	0	0	0					3,950	8,956	8,147	6,520	5,644	$7,959	1
210	7050	1/2 Ton Pickup	1987	$14,700	0	0	0	0	13,200	9,900	6,600	3,300	0	0					2,306	7,942	8,325	6,521	5,468	$7,573	1
210	7068	1/2 Ton Pickup	1987	$14,700	0	0	0	0	13,200	9,900	6,600	3,300	0	0					2,061	2,048	1,870	3,554	8,050	$7,563	1
210	7092	1/2 Ton Pickup	1987	$14,700	0	0	0	0	13,200	9,900	6,600	3,300	0	0					1,749	3,560	3,591	3,310	569	$2,773	1
210	7100	1/2 Ton Pickup	1987	$14,700	0	0	0	0	13,200	9,900	6,600	3,300	0	0					2,221	13,560	13,667	8,824	11,400	$14,021	1
210	7118	1/2 Ton Pickup	1987	$14,700	0	0	0	0	13,200	9,900	6,600	3,300	0	0					2,484	6,434	6,158	8,695	12,972	$13,420	1
210	7126	1/2 Ton Pickup	1987	$14,700	0	0	0	0	13,200	9,900	6,600	3,300	0	0					6,662	2,480	2,858	3,350	12,170	$10,069	1
210	7134	1/2 Ton Pickup	1987	$14,700	0	0	0	0	13,200	9,900	6,600	3,300	0	0					1,420	6,353	6,523	1,405	3,155	$3,858	1
210	7142	1/2 Ton Pickup	1987	$14,700	0	0	0	0	13,200	9,900	6,600	3,300	0	0					1,709	6,940	7,005	1,960	10,066	$11,038	1
210	7159	1/2 Ton Pickup	1987	$14,700	0	0	0	0	13,200	9,900	6,600	3,300	0	0					2,297	7,120	7,735	6,920	6,119	$9,871	1
210	7167	1/2 Ton Pickup	1987	$14,700	0	0	0	0	13,200	9,900	6,600	3,300	0	0					1,956	6,159	8,037	6,870	5,420	$9,175	1
210	7175	1/2 Ton Pickup	1987	$14,700	0	0	0	0	13,200	9,900	6,600	3,300	0	0					3,767	5,100	5,349	7,820	5,475	$7,343	1

UNIT #		EQUIPMENT CLASS	MODEL	COST NEW	ANNUAL OWNERSHIP EQUIPMENT COSTS 1983	1984	1985	1986	1987	1988	1989	1990	1991	FORECAST 1992	ANNUAL EQUIPMENT O&M COSTS 1983	1984	1985	1986	1987	1988	1989	1990	1991	FORECAST 1992	REPLACE EQUIP? (YES=1; NO=0)
210	7183	1/2 Ton Pickup	1987	$14,700	0	0	0	0	13,200	9,900	6,600	3,300	0	0				1,971	7,727	8,654	8,786	9,466	$12,197	1
110	9099	1/2 Ton Pickup	1989	$14,700	0	0	0	0	0	0	13,800	10,350	6,900	3,450									$0	0
210	139	1/2 Ton Pickup	1990	$14,700	0	0	0	0	0	0	0	14,000	10,500	7,000							200	2,036	$3,872	0
210	147	1/2 Ton Pickup	1990	$14,700	0	0	0	0	0	0	0	14,000	10,500	7,000							165	1,885	$3,585	0
210	155	1/2 Ton Pickup	1990	$14,700	0	0	0	0	0	0	0	14,000	10,500	7,000								1,635	$1,635	0
210	238	1/2 Ton Pickup	1990	$14,700	0	0	0	0	0	0	0	14,000	10,500	7,000							4,920	3,810	$2,700	0
210	0246	1/2 Ton Pickup	1990	$14,700	0	0	0	0	0	0	0	14,000	10,500	7,000							5,510	7,093	$8,576	1
210	0253	1/2 Ton Pickup	1990	$14,700	0	0	0	0	0	0	0	14,000	10,500	7,000							4,950	3,566	$2,222	0
210	0261	1/2 Ton Pickup	1990	$14,700	0	0	0	0	0	0	0	14,000	10,500	7,000							5,415	7,245	$9,075	1
210	0279	1/2 Ton Pickup	1990	$14,700	0	0	0	0	0	0	0	14,000	10,500	7,000							3,540	3,803	$4,070	0
210	1152	1/2 Ton Pickup	1991	$14,700	0	0	0	0	0	0	0	0	14,400	10,800									$0	0
111	8512	One Ton Truck	1988	$20,400	0	0	0	0	0	14,800	11,100	7,400	3,700	0					3,605	3,750	9,760	7,210	$10,288	1
111	8538	One Ton Truck	1988	$20,400	0	0	0	0	0	14,800	11,100	7,400	3,700	0					7,340	7,963	7,270	6,817	$8,782	1
111	5286	One Ton Truck	1985	$20,400	0	0	13,200	9,900	6,600	3,300	0	0	0	0	1,555	6,284	8,552	13,934	15,599	11,150	21,379		$22,101	1
111	5294	One Ton Truck	1985	$20,400	0	0	13,200	9,900	6,600	3,300	0	0	0	0	3,179	7,832	7,759	15,029	14,663	12,330	11,810		$15,872	1
111	5342	One Ton Truck	1986	$20,400	0	0	0	12,500	9,375	6,250	3,125	0	0	0				3,248	8,468	9,296	14,690	5,553	$11,801	1
111	8359	One Ton Truck	1986	$20,400	0	0	0	12,500	9,375	6,250	3,125	0	0	0				8,898	8,775	8,456	7,960	10,089	$8,306	1
111	8367	One Ton Truck	1986	$20,400	0	0	0	12,500	9,375	6,250	3,125	0	0	0				6,320	7,457	7,874	13,123	15,817	$17,515	1
211	5259	One Ton Truck	1986	$20,400	0	0	0	12,500	9,375	6,250	3,125	0	0	0				2,758	9,790	10,444	6,985	14,025	$14,272	1
211	7016	One Ton Truck	1987	$20,400	0	0	0	0	13,300	9,975	6,650	3,325	0	0				3,259	2,182	2,493	8,902	4,794	$7,139	1
211	7026	One Ton Truck	1987	$20,400	0	0	0	0	13,300	9,975	6,650	3,325	0	0				3,882	4,571	4,198	4,315	12,426	$10,968	1
211	8497	One Ton Truck	1988	$20,400	0	0	0	0	0	14,800	11,100	7,400	3,700	0					8,789	9,814	20,348	20,629	$26,418	1
211	8503	One Ton Truck	1988	$20,400	0	0	0	0	0	14,800	11,100	7,400	3,700	0					7,486	7,868	11,385	16,143	$18,883	1
211	9300	One Ton Truck	1989	$20,400	0	0	0	0	0	0	16,000	12,000	8,000	4,000						968	3,544	6,244	$8,963	1
211	8495	One Ton Truck	1988	$20,400	0	0	0	0	0	14,800	11,100	7,400	3,700	0					8,576	7,448	9,570	18,723	$19,370	1
211	7190	One Ton Truck	1987	$20,400	0	0	0	0	13,300	9,975	6,650	3,325	0	0					11,656	11,725	10,420	10,990	$10,372	1
211	13	One Ton Truck	1990	$20,400	0	0	0	0	0	0	0	18,000	13,500	9,000							7,920	5,265	$2,910	0
211	54	One Ton Truck	1990	$20,400	0	0	0	0	0	0	0	18,000	13,500	9,000								2,370	$2,370	0
211	302	One Ton Truck	1990	$20,400	0	0	0	0	0	0	0	18,000	13,500	9,000								3,630	$3,630	0
211	9212	One Ton Truck	1989	$20,400	0	0	0	0	0	0	16,000	12,000	8,000	4,000							1,374	6,530	$11,066	1
311	116x	One Ton Truck	1991	$20,400	0	0	0	0	0	0	0	0	20,400	15,300								4,362	$4,362	0
111	8520	One Ton Truck	1988	$20,400	0	0	0	0	0	14,800	11,100	7,400	3,700	0					19,831	20,930	19,056	11,410	$11,024	1
211	1177	Utility Truck	1991	$20,400	0	0	0	0	0	0	0	0	20,400	10,200								8,999	$8,999	1

UNIT #		EQUIPMENT CLASS	MODEL	COST NEW	ANNUAL OWNERSHIP EQUIPMENT COSTS 1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	FORECAST	ANNUAL EQUIPMENT O&M COSTS 1983	1984	1985	1986	1987	1988	1989	1990	1991	FORECAST 1992	REPLACE EQUIP? (YES=1; NO=0)
113	8783	VAN	1986	$17,500	0	0	0	0	0	14,000	10,500	7,000	3,500	0						2,488	2,986	4,200	6,842	$7,700	1
112	5244	VAN	1985	$17,500	0	0	12,400	8,300	6,200	3,100	0	0	0	0		5,054	9,406	5,864	11,240	12,985	11,545	10,399			$13,332	1
212	6127	VAN	1986	$17,500	0	0	0	13,700	10,275	6,850	3,425	0	0	0						3,888	7,903	6,713	9,591	9,696	$11,327	1
212	6175	VAN	1986	$17,500	0	0	0	13,700	10,275	6,850	3,425	0	0	0						1,236	8,027	8,515	10,910	6,562	$11,219	1
212	6233	VAN	1986	$17,500	0	0	0	13,700	10,275	6,850	3,425	0	0	0		1,156	4,170	4,270	3,256	6,730	4,552	$5,97[illegible]				1
212	8577	VAN	1988	$17,500	0	0	0	0	0	14,000	10,500	7,000	3,500	0						319	5,441	764	5,911	$5,534	1
312	8543	VAN	1988	$17,500	0	0	0	0	0	14,000	10,500	7,000	3,500	0						2,640	2,267	5,383	11,951	$13,823	1
112	96	VAN	1990	$17,500	0	0	0	0	0	0	0	15,500	11,625	7,750								340	4,043	$7,746	0
112	104	VAN	1990	$17,500	0	0	0	0	0	0	0	15,500	11,625	7,750								320	3,669	$8,858	0
112	0112	VAN	1990	$17,500	0	0	0	0	0	0	0	15,500	11,625	7,750								215	2,781	$5,347	0
212	0046	VAN	1990	$17,500	0	0	0	0	0	0	0	15,500	11,625	7,750								1,040	4,766	$8,492	1
212	0061	VAN	1990	$17,500	0	0	0	0	0	0	0	15,500	11,625	7,750								417	876	$1,335	0
212	0079	VAN	1990	$17,500	0	0	0	0	0	0	0	15,500	11,625	7,750								624	1,420	$1,916	0
212	0087	VAN	1990	$17,500	0	0	0	0	0	0	0	15,500	11,625	7,750								682	1,380	$2,158	0
212	0285	VAN	1990	$17,500	0	0	0	0	0	0	0	15,500	11,625	7,750								2,231	4,581	$6,841	0
212	0293	VAN	1990	$17,500	0	0	0	0	0	0	0	15,500	11,625	7,750								3,167	3,807	$4,467	0
312	1209	VAN	1991	$17,500	0	0	0	0	0	0	0	0	17,500	13,125									4,780	$4,780	0
312	1217	VAN	1991	$17,500	0	0	0	0	0	0	0	0	17,500	13,125									1,425	$1,425	0
312	1385	VAN	1991	$17,500	0	0	0	0	0	0	0	0	17,500	13,125									451	$451	0
																										0
114	5085	Sm. [illegible]k-up	1985	$14,900	0	0	10,000	7,500	5,000	2,500	0	0	0	0		1,021	1,584	3,167	8,634	8,170	5,126	3,942		$7,997	1
114	8154	Small Pick-up	1988	$14,900	0	0	0	0	0	14,000	10,500	7,000	3,500	0						2,790	2,806	4,735	5,596	$6,617	1
114	8378	Small Pick-up	1988	$14,900	0	0	0	0	0	14,000	10,500	7,000	3,500	0						1,392	1,272	2,160	6,898	$10,282	1
214	9639	Small Pick-up	1989	$14,900	0	0	0	0	0	0	14,000	10,500	7,000	3,500								1,856	1,910	3,502	$4,067	1
114	334	Small Pick-up	1990	$14,900	0	0	0	0	0	0	0	14,500	10,875	7,250									1,780	718	($344)	0
214	28	Small Pick-up	1990	$14,900	0	0	0	0	0	0	0	14,500	10,875	7,250									696	1,002	$1,396	0
214	36	Small Pick-up	1990	$14,900	0	0	0	0	0	0	0	14,500	10,875	7,250									433	1,508	$2,193	0
120	5228	Hoist Truck	1985	$88,400	0	0	61,500	53612.5	46,125	38,438	30,750	23,063	15,375	7,688						8413	10,929	15,021	17,488	13,670	8,745	$27,196	1
120	5236	Hoist Truck	1985	$88,400	0	0	61,500	53,813	46,125	38,438	30,750	23,063	15,375	7,688						8,062	11,299	14,360	14,450	7,553	12,140	$12,235	1
420	2065	Hoist Truck	1982	$88,400	34,125	29,250	24,375	19,500	14,625	9,750	4,875	0	0	0		2,202	2,927	6,832	9,568	11,255	10,900	13,023	17,848	15,157	$19,159	1
124	3492	25 Yd Collectomatic	1983	$146,200	82,000	71,750	61,500	51,250	41,000	30,750	20,500	10,250	0	0		9,219	21,375	25,688	25,224	32,610	30,749	22,100	32,405	$35,145	1
424	5098	25 Yd Collectomatic	1985	$146,200	0	0	85,500	74,813	64,125	53,438	42,750	32,063	21,375	10,688				8,833	22,514	21,907	41,040	38,364	41,520	39,920	$51,403	1
424	6047	25 Yd Collectomatic	1986	$146,200	0	0	0	90,000	81,375	69,750	58,125	46,500	34,875	23,250					11,473	28,750	34,289	32,240	41,526		$48,730	1

UNIT #	EQUIPMENT CLASS	MODEL	COST NEW	ANNUAL OWNERSHIP EQUIPMENT COSTS 1983	1984	1985	1986	1987	1988	1989	1990	1991	FORECAST 1992	ANNUAL EQUIPMENT O&M COSTS 1983	1984	1985	1986	1987	1988	1989	1990	1991	FORECAST 1992	REPLACE EQUIP.? (YES=1; NO=0)
424	6254 25 Yd Collectomatic	1985	$146,200	0	0	0	93,000	81,375	69,750	58,125	46,500	34,875	23,250					13,931	25,960	26,794	38,115	32,800	$43,170	1
424	6276 25 Yd Collectomatic	1986	$146,200	0	0	0	93,000	81,375	69,750	58,125	46,500	34,875	23,250					21,622	44,795	38,834	44,105	31,188	$41,643	1
424	7037 25 Yd Collectomatic	1987	$146,200	0	0	0	0	111,500	97,563	83,625	69,688	55,750	41,813						35,015	37,322	25,310	36,128	$31,518	0
424	7094 25 Yd Collectomatic	1987	$146,200	0	0	0	0	111,500	97,563	83,625	69,688	55,750	41,813						36,420	38,275	36,200	46,533	$48,423	1
424	7102 25 Yd Collectomatic	1987	$146,200	0	0	0	0	111,500	97,563	83,625	69,688	55,750	41,813						30,890	36,184	44,720	60,314	$57,229	1
424	7110 25 Yd Collectomatic	1987	$146,200	0	0	0	0	111,500	97,563	83,625	69,688	55,750	41,813						36,409	37,900	44,305	45,091	$49,039	1
424	7128 25 Yd Collectomatic	1987	$146,200	0	0	0	0	111,500	97,563	83,625	69,688	55,750	41,813						34,764	37,850	39,455	43,510	$45,856	1
424	7144 25 Yd Collectomatic	1987	$146,200	0	0	0	0	111,500	97,563	83,625	69,688	55,750	41,813						35,500	37,805	33,105	61,508	$60,311	1
424	5569 25 Yd Collectomatic	1985	$146,200	0	0	85,500	74,813	64,125	53,438	42,750	32,063	21,375	10,688						46,241	45,450	45,785	51,178	$50,950	1
424	8811 25 Yd Collectomatic	1988	$146,200	0	0	0	0	0	130,000	113,750	97,500	81,250	65,000						14,606	17,700	19,306	44,964	$47,014	0
424	8829 25 Yd Collectomatic	1988	$146,200	0	0	0	0	0	130,000	113,750	97,500	81,250	65,000						12,131	14,625	22,345	37,158	$42,415	0
426	1020 25 Yd Collectomatic	1991	$146,200	0	0	0	0	0	0	0	0	146,000	127,750									7,179	$7,179	0
426	1036 25 Yd Collectomatic	1991	$146,200	0	0	0	0	0	0	0	0	146,000	127,750									7,992	$7,992	0
426	1111 25 Yd Collectomatic	1991	$146,200	0	0	0	0	0	0	0	0	146,000	127,750									3,480	$3,480	0
125	3483 16 Yd collectomatic	1983	$97,800	60,000	52,500	45,000	37,500	30,000	22,500	15,000	7,500	0	0		6,977	16,910	25,618	29,320	30,895	32,045	22,320	44,750	$43,096	1
425	2524 16 Yd collectomatic	1982	$97,800	49,000	42,000	35,000	28,000	21,000	14,000	7,000	0	0	0		9,533	21,401	24,561	23,633	29,182	57,820	58,825	20,345	18,640	$49,425
425	2532 16 Yd collectomatic	1982	$97,800	49,000	42,000	35,000	28,000	21,000	14,000	7,000	0	0	0		13,720	20,017	49,736	33,228	34,160	22,305	24,650	23,115	31,825	$38,036
425	5105 16 Yd collectomatic	1985	$97,800	0	0	63,000	55,125	47,250	39,375	31,500	23,625	15,750	7,875			12,019	18,081	24,941	25,532	27,580	36,140	24,708	$35,409	1
426	6290 Water Tanker	1985	$52,900	0	0	0	43,800	35,833	28,867	21,900	14,933	7,967	[0]			11,235	13,208	28,934	34,045	25,857	35,912	$41,217	1
237	8644 Compact Cars	1988	$14,000	0	0	0	0	0	12,000	9,600	7,200	4,800	2,400							2,462	1,736	1,320	$715	0
137	5310 Compact Cars	1985	$14,000	0	0	9,100	7,280	5,460	3,640	1,820	0	0	0		1,096	2,049	5,694	3,830	5,408	3,262	$5,532	1
237	1102 Compact Cars	1991	$14,000	0	0	0	0	0	0	0	0	14,000	11,200								2,365			0
237	5111 Compact Cars	1985	$14,000	0	0	9,100	7,280	5,460	3,640	1,820	0	0	0			1,464	900	2,840	9,120	1,460	$5,862	1
237	5129 Compact Cars	1985	$14,000	0	0	9,100	7,280	5,460	3,640	1,820	0	0	0			3,598	5,198	7,582	9,240	11,477	$13,609	1
237	5137 Compact Cars	1985	$14,000	0	0	9,100	7,280	5,460	3,640	1,820	0	0	0			2,189	4,174	3,799	1,345	3,965	$3,311	1
237	5145 Compact Cars	1985	$14,000	0	0	9,100	7,280	5,460	3,640	1,820	0	0	0			1,391	9,085	9,212	7,180	8,573	$10,810	1
237	7042 Compact Cars	1987	$14,000	0	0	0	0	10,500	8,400	6,300	4,200	2,100	0			1,071	1,829	2,116	3,120	6,144	$6,337	1
237	8651 Compact Cars	1988	$14,000	0	0	0	0	0	12,000	9,600	7,200	4,800	2,400						783	2,462	3,170	1,057	$2,401	1
237	8669 Compact Cars	1988	$14,000	0	0	0	0	0	12,000	9,600	7,200	4,800	2,400						706	717	1,460	1,347	$1,733	0
237	8677 Compact Cars	1988	$14,000	0	0	0	0	0	12,000	9,600	7,200	4,800	2,400						802	684	475	1,460	$1,297	0
237	8685 Compact Cars	1988	$14,000	0	0	0	0	0	12,000	9,600	7,200	4,800	2,400						579	759	767	951	$1,045	0
237	8701 Compact Cars	1988	$14,000	0	0	0	0	0	12,000	9,600	7,200	4,800	2,400						1,000	944	1,124	1,734	$2,146	0

UNIT #		EQUIPMENT CLASS	MODEL	COST NEW	ANNUAL OWNERSHIP EQUIPMENT COSTS 1983	1984	1985	1986	1987	1988	1989	1990	1991	FORECAST 1992	ANNUAL EQUIPMENT O&M COSTS 1983	1984	1985	1986	1987	1988	1989	1990	1991	FORECAST 1992	REPLACE EQUIP.? (YES=1; NO=0)
237	8719	Compact Cars	1988	$14,000	0	0	0	0	0	12,000	9,600	7,200	4,800	2,400						530	506	1,035	810	$1,063	0
237	8727	Compact Cars	1988	$14,000	0	0	0	0	0	12,000	9,600	7,200	4,800	2,400						457	460	662	1,609	$1,707	0
237	8735	Compact Cars	1988	$14,000	0	0	0	0	0	12,000	9,600	7,200	4,800	2,400						486	473	1,194	1,503	$1,857	0
237	8743	Compact Cars	1988	$14,000	0	0	0	0	0	12,000	9,600	7,200	4,800	2,400						366	2,246	2,505	1,400	$2,470	1
237	8750	Compact Cars	1988	$14,000	0	0	0	0	0	12,000	9,600	7,200	4,800	2,400						2,444	2,389	168	749	$11	0
237	8768	Compact Cars	1988	$14,000	0	0	0	0	0	12,000	9,600	7,200	4,800	2,400						879	883	2,067	2,321	$2,915	1
237	8776	Compact Cars	1988	$14,000	0	0	0	0	0	12,000	9,600	7,200	4,800	2,400						280	328	1,566	679	$1,383	0
237	9147	Compact Cars	1989	$14,000	0	0	0	0	0	0	12,500	10,000	7,500	5,000							83	947	1,707	$2,523	0
237	9154	Compact Cars	1989	$14,000	0	0	0	0	0	0	12,500	10,000	7,500	5,000							18	658	1,034	$1,566	0
237	9162	Compact Cars	1989	$14,000	0	0	0	0	0	0	12,500	10,000	7,500	5,000								250	1,261	$2,312	0
237	9170	Compact Cars	1989	$14,000	0	0	0	0	0	0	12,500	10,000	7,500	5,000								1,490	1,291	$1,086	0
237	1102	Compact Cars	1991	$14,000	0	0	0	0	0	0	0	0	14,000	11,200										$0	0
146	8651	Street Broom	1978	$154,000	32,625	21,750	10,875	0	0	0	0	0	0	0	12,346	27,740	23,889	34,852	33,000	43,204	41,133	27,240	35,700	$42,685	1
146	8586	Street Broom	1988	$154,000	0	0	0	0	0	137,500	119,675	102,750	85,625	68,500						27,726	32,600	45,325	64,018	$72,818	1
546	6305	Street Broom	1986	$154,000	0	0	0	125,000	109,375	93,750	78,125	62,500	46,875	31,250				14,139	26,359	33,742	36,377	41,505	41,025	$50,441	1
252	2134	Large Backhoe	1991	$186,000	0	0	0	0	0	0	0	0	186,000	170,500										$0	0
354	7080	Small Backhoe	1987	$95,000	0	0	0	0	56,000	46,667	37,333	28,000	18,667	9,333						8,340	8,345	15,940	14,200	$18,000	1
354	8690	Small Backhoe	1988	$95,000	0	0	0	0	0	57,000	47,500	38,000	28,500	19,000						6,030	8,118	11,547	20,936	$23,695	1
466	5709	Gang Mower	1965	$33,000	0	0	0	0	0	0	0	0	0	0		762	2,237	2,640	1,544	1,905	1,960	1,060	2,520	$2,083	1
466	7275	Gang Mower	1977	$33,000	6,500	3,250	0	0	0	0	0	0	0	0	1,939	1,582	3,496	1,887	2,035	2,405	2,654	2,417	10,063	$5,984	1
166	2048	Gang Mower	1982	$33,000	15,750	13,500	11,250	9,000	6,750	4,500	2,250	0	0	0	1,389	8,048	6,810	7,503	2,795	2,017	883	621	4,760	$1,580	1
366	4026	Gang Mower	1984	$33,000	0	6,400	5,600	4,800	4,000	3,200	2,400	1,600	800	0		27	655	1,717	2,587	1,372	2,194	3,670	2,350	$3,512	1
366	4034	Gang Mower	1984	$33,000	0	6,400	5,600	4,800	4,000	3,200	2,400	1,600	800	0		54	1,245	937	1,365	2,262	317	1,702	3,643	$3,530	1
366	6138	Gang Mower	1986	$33,000	0	0	0	7,000	6,125	5,250	4,375	3,500	2,625	1,750				733	3,742	2,492	2,821	2,572	2,795	$3,239	1
366	6146	Gang Mower	1986	$33,000	0	0	0	7,000	6,125	5,250	4,375	3,500	2,625	1,750				494	1,917	4,477	3,234	2,919	4,046	$4,800	1
466	9099	Gang Mower	1979	$33,000	8,500	6,375	4,250	2,125	0	0	0	0	0	0	4,285	669	343	4,394	3,058	5,539	5,339	2,687	5,159	$5,221	1
466	9107	Gang Mower	1979	$33,000	8,500	6,375	4,250	2,125	0	0	0	0	0	0	990	1,609	892	225	1,699	1,495	1,228	2,166	1,656	$1,663	1
566	30	Gang Mower	1980	$33,000	10,938	8,750	6,563	4,375	2,188	0	0	0	0	0	2,979	1,320	1,255	4,435	1,551	1,741	1,705	564	1,950	$1,270	1
766	3048	Gang Mower	1983	$33,000	16,500	16,275	13,950	11,625	9,300	6,975	4,650	2,325	0	0		26	50	90	306	1,864	2,057	2,020	4,375	$3,906	1
766	3073	Gang Mower	1983	$33,000	16,500	16,275	13,950	11,625	9,300	6,975	4,650	2,325	0	0		3,332	2,710	1,954	1,187	822	1,080	1,231	1,884	$676	1
166	8605	Gang Mower	1988	$33,000	0	0	0	0	0	28,000	24,500	21,000	17,500	14,000						3,775	3,550	1,133	9,632	$8,421	0

UNIT #		EQUIPMENT CLASS	MODEL	COST NEW	ANNUAL OWNERSHIP EQUIPMENT COSTS 1983	1984	1985	1986	1987	1988	1989	1990	1991	FORECAST 1992	ANNUAL EQUIPMENT O&M COSTS 1983	1984	1985	1986	1987	1988	1989	1990	1991	FORECAST 1992	REPLACE EQUIP.? (YES=1; NO=0)
177	5897	Blower Attachment	1976	$114,000	26,667	23,333	20,000	16,667	13,333	10,000	6,667	3,333	(0)	0	1,269	304	569	28,112	32,653	7,865	7,815	1,239	1,657	$9,656	1
377	5863	Blower Attachment	1975	$114,000	23,333	20,000	16,667	13,333	10,000	6,667	3,333	(0)	0	0	1,112	3,756	4,373	4,855	17,285	17,490	15,632	3,640	14,200	$16,407	1
377	5889	Blower Attachment	1975	$114,000	23,333	20,000	16,667	13,333	10,000	6,667	3,333	(0)	0	0	8,991	473	5,225	4,245	8,824	19,042	14,550	4,459	8,550	$11,899	1
377	9188	Blower Attachment	1979	$114,000	44,000	40,000	36,000	32,000	28,000	24,000	20,000	16,000	12,000	8,000	5,598	3,233	8,448	13,038	24,079	34,269	34,220	4,929	15,200	$25,288	1
377	146	Blower Attachment	1980	$114,000	48,000	44,000	40,000	36,000	32,000	28,000	24,000	20,000	16,000	12,000	3,766	3,050	4,817	4,122	21,498	26,023	26,650	7,346	9,739	$22,431	1
277	5914	Blower Attachment	1965	$114,000	0	0	0	0	0	0	0	0	0	0	7,485	575	5,396	3,843	16,058	30,800	38,430	21,259	14,329	$32,800	1
277	5922	Blower Attachment	1965	$114,000	0	0	0	0	0	0	0	0	0	0	6,092	2,635	8,728	16,054	24,114	48,643	45,550	17,700	12,240	$34,863	1
277	5930	Blower Attachment	1965	$114,000	0	0	0	0	0	0	0	0	0	0	1,829	939	8,896	10,536	24,493	26,215	25,500	14,115	16,629	$26,185	1
577	9329	Blower Attachment	1989	$114,000	0	0	0	0	0	0	110,000	102,667	95,333	88,000							21,693	14,400	28,400	$26,871	0
577	9335	Blower Attachment	1989	$114,000	0	0	0	0	0	0	110,000	102,667	95,333	88,000							13,700	14,650	13,100	$14,883	0
577	9343	Blower Attachment	1989	$114,000	0	0	0	0	0	0	110,000	102,667	95,333	88,000							10,640	21,015	22,240	$30,898	0
577	9350	Blower Attachment	1989	$114,000	0	0	0	0	0	0	110,000	102,667	95,333	88,000							24,300	9,565	18,200	$11,235	0
202	2101	Loader/Snowblower - Tract	1992	$229,000	0	0	0	0	0	0	0	0	0	0	28,420	4,635	7,429	17,532	43,272	35,421	38,800	21,415	25,405	$38,813	1
202	2119	Loader/Snowblower - Tract	1992	$229,000	0	0	0	0	0	0	0	0	0	0	16,233	7,827	13,554	15,977	44,707	28,010	31,700	34,659	29,556	$37,764	1
218	5114	Compressor - Mounted	1985	$25,000	0	0	16,000	13,714	11,429	9,143	6,857	4,571	2,286	(0)			3,432	6,377	9,488	13,823	10,195	1,535	12,786	$15,163	1
218	5122	Compressor - Mounted	1985	$25,000	0	0	16,000	13,714	11,429	9,143	6,857	4,571	2,286	(0)			2,149	3,800	5,796	8,913	8,925	7,338	12,553	$12,979	1
218	1198	Compressor - Mounted	1991	$25,000	0	0	0	0	0	0	0	0	25,000	21,429									5,565	$5,565	0
218	1196	Compressor - Mounted	1991	$25,000	0	0	0	0	0	0	0	0	25,000	21,429									10,452	$10,452	0
650	9229	Small Sweeper	1989	$39,000	0	0	0	0	0	0	20,000	18,000	16,000	14,000							125	1,344	2,819	$4,790	0
257	4944	Large Roller	1974	$105,000	3,300	0	0	0	0	0	0	0	0	0	4,756	4,617	1,122	5,671	5,429	3,570	3,480	1,650	1,650	$4,662	1
307	2543	Small Dozer	1982	$65,000	24,300	21,600	18,900	16,200	13,500	10,800	8,100	5,400	2,700	0	2,946	24,729	7,573	17,202	668	4,655	1,622	230	6,660	$648	1
331	9084	Pothole Patcher	1989	$92,400	0	0	0	0	0	0	85,500	74,143	61,786	48,429							2,045	11,056	9,814	$15,985	0
431	3474	Pothole Patcher	1983	$92,400	71,350	61,157	50,964	40,771	30,579	20,386	10,193	(0)	0	0	4,711	9,939	10,671	20,244	8,791	9,355	12,467	21,630	$18,964	1
416	9025	5 Ton Dump Truck	1989	$95,000	0	0	0	0	0	0	91,000	72,800	54,600	36,400							9,004	11,946	22,200	$29,966	0
416	9033	5 Ton Dump Truck	1989	$95,000	0	0	0	0	0	0	91,000	72,800	54,600	36,400							11,600	21,100	45,034	$50,345	1
416	9041	5 Ton Dump Truck	1989	$95,000	0	0	0	0	0	0	91,000	72,800	54,600	36,400							6,823	16,155	23,291	$31,891	0
416	9058	5 Ton Dump Truck	1989	$95,000	0	0	0	0	0	0	91,000	72,800	54,600	36,400							4,365	20,045	24,613	$26,589	1
416	9066	5 Ton Dump Truck	1989	$95,000	0	0	0	0	0	0	91,000	72,800	54,600	36,400							4,420	21,340	30,965	$45,480	1

UNIT #		EQUIPMENT CLASS	MODEL	COST NEW	ANNUAL OWNERSHIP EQUIPMENT COSTS 1983	1984	1985	1986	1987	1988	1989	1990	1991	FORECAST 1992	ANNUAL EQUIPMENT O&M COSTS 1983	1984	1985	1986	1987	1988	1989	1990	1991	FORECAST 1992	REPLACE EQUIP? (YES=1; NO=0)
415	9874	5 Ton Dump Truck	1988	$85,000	0	0	0	0	0	91,000	72,800	54,600	36,400	18,200							4,709	6,495	25,668	36,912	$47,291	1
416	2442	5 Ton Dump Truck	1982	$95,000	32800	24,600	16,400	8,200	0	0	0	0	0	0	5373	6,842	11,256	22,348	9,707	14,760	10,766	18,946	8,075	$14,960	1
416	3977	5 Ton Dump Truck	1983	$95,000	41,000	32,800	24,600	16,400	8,200	0	0	0	0	0	2,999	4,384	4,070	7,527	25,091	24,631	25,987	16,900	26,579	$28,997	1
416	5155	5 Ton Dump Truck	1985	$95,000	0	0	62,500	50,000	37,500	25,000	12,500	0	0	0				30,855	38,296	52,550	53,426	47,120	33,320	$46,828	1
416	5163	5 Ton Dump Truck	1985	$95,000	0	0	62,500	50,000	37,500	25,000	12,500	0	0	0				17,938	27,685	28,200	33,868	25,300	47,514	$43,925	1
416	5171	5 Ton Dump Truck	1985	$95,000	0	0	62,500	50,000	37,500	25,000	12,500	0	0	0				23,158	37,729	28,700	31,583	32,500	35,736	$36,576	1
416	6062	5 Ton Dump Truck	1986	$95,000	0	0	0	86,500	69,200	51,900	34,600	17,300	0	0					17,245	33,300	25,824	36,330	58,200	$59,662	1
416	6070	5 Ton Dump Truck	1986	$95,000	0	0	0	86,500	69,200	51,900	34,600	17,300	0	0					22,900	28,250	25,468	49,320	33,223	$44,346	1
416	6161	5 Ton Dump Truck	1986	$95,000	0	0	0	86,500	69,200	51,900	34,600	17,300	0	0					12,059	20,574	40,820	38,556	21,700	46,091	$48,991	1
416	6179	5 Ton Dump Truck	1986	$95,000	0	0	0	86,500	69,200	51,900	34,600	17,300	0	0					8,946	23,859	27,043	30,731	31,250	50,173	$51,867	1
416	6187	5 Ton Dump Truck	1986	$95,000	0	0	0	86,500	69,200	51,900	34,600	17,300	0	0					7,884	15,195	35,328	35,279	21,540	36,762	$42,616	1
416	6195	5 Ton Dump Truck	1986	$95,000	0	0	0	86,500	69,200	51,900	34,600	17,300	0	0					8,400	20,449	45,900	46,661	26,800	52,100	$54,415	1
416	6203	5 Ton Dump Truck	1986	$95,000	0	0	0	86,500	69,200	51,900	34,600	17,300	0	0					7,266	14,829	21,650	22,350	21,901	37,524	$38,743	1
416	6211	5 Ton Dump Truck	1986	$95,000	0	0	0	86,500	69,200	51,900	34,600	17,300	0	0					10,170	23,657	27,348	28,425	43,980	36,409	$50,902	1
416	6245	5 Ton Dump Truck	1986	$95,000	0	0	0	86,500	69,200	51,900	34,600	17,300	0	0					7,961	15,985	16,266	18,710	25,431	$30,361	1
416	6252	5 Ton Dump Truck	1986	$95,000	0	0	0	86,500	69,200	51,900	34,600	17,300	0	0					7,691	13,790	15,445	15,323	19,416	$23,826	1
416	7078	5 Ton Dump Truck	1987	$95,000	0	0	0	0	86,000	70,400	52,800	35,200	17,600	0					10,891	28,120	27,478	16,500	37,601	$38,156	1
416	1056	5 Ton Dump Truck	1991	$95,000	0	0	0	0	0	0	0	0	95000	76,000									1304	$1,304	0
416	1074	5 Ton Dump Truck	1991	$95,000	0	0	0	0	0	0	0	0	95000	76,000									1370	$1,370	0
416	1052	5 Ton Dump Truck	1991	$95,000	0	0	0	0	0	0	0	0	95000	76,000									2791	$2,791	0
416	1090	5 Ton Dump Truck	1991	$95,000	0	0	0	0	0	0	0	0	95000	76,000									1118	$1,118	0
417	7200	Tandem Dump Truck	1987	$132,000	0	0	0	0	116,500	93,200	69,900	46,600	23,300	0					21,923	46,450	55,789	45,906	55,820	$65,300	1
417	7218	Tandem Dump Truck	1987	$132,000	0	0	0	0	116,500	93,200	69,900	46,600	23,300	0					27,310	61,045	55,116	44,250	62,483	$66,090	1
417	8448	Tandem Dump Truck	1988	$132,000	0	0	0	0	0	120,000	96,000	72,000	48,000	24,000							33,800	42,059	42,550	39,889	$43,264	1
422	7013	Sewer Jet	1987	$104,500	0	0	0	0	90,000	78,750	67,500	56,250	45,000	33,750							11,190	14,360	12,525	22,020	$25,668	0
501	7611	Grader	1987	$120,000	0	0	0	0	100,000	90000	80,000	70,000	60,000	50,000							28390	32,873	22,990	44,044	$41,844	0
501	9286	Grader	1989	$120,000	0	0	0	0	0	0	110,000	99,000	88,000	77,000								14,376	33,312	38,150	$52,387	0
501	6084	Grader	1986	$120,000	0	0	0	100,000	90,000	80,000	70,000	60,000	50,000	40,000							25,013	46,120	37,883	31,005	24,390	$27,970	0
501	6092	Grader	1986	$120,000	0	0	0	100,000	90,000	80,000	70,000	60,000	50,000	40,000							27,831	42,243	42,039	20,648	27,763	$25,566	0

APPENDIX L

TYPICAL FRAPOF PRIORITY MODULE

APPENDIX L EQUIPMENT REPLACEMENT PRIORITY MODULE PRESENT YEAR: 1991
LAST UPDATE: NOV.1991

UNIT #		EQUIPMENT CLASS	MODEL	COST NEW	ANNUAL SALVAGE VALUE 1983	1984	1985	1986	1987	1988	1989	1990	1991	FORE-CAST 1992	ANNUAL EQUIPMENT O&M COSTS 1983	1984	1985	1986	1987	1988	1989	1990	1991	FORE-CAST 1992	PRIORITY FACTOR	CUMMU-LATIVE NEW COST
110	5030	1/2 Ton Pickup	1985	$14,700	0	0	9,500	7,125	4,719	2,375	0	0	0	0			2,994	4,704	6,318	16,085	15,028	9,532	17,258	19,004	6.180	14,700
111	5286	One Ton Truck	1985	$22,400	0	0	13,200	9,900	6,600	3,300	0	0	0	0			1,555	6,494	8,552	13,804	15,589	11,150	21,379	22,101	4.929	35,100
110	6152	1/2 Ton Pickup	1986	$14,700	0	0	0	10,000	7,500	5,000	2,500	0	0	0				1,929	5,016	6,300	8,724	14,200	15,300	17,729	4.571	49,800
112	5244	VAN	1985	$17,500	0	0	12,400	9,300	6,200	3,100	0	0	0	0			5,054	9,406	5,884	11,240	12,665	11,545	10,395	13,322	4.545	67,300
210	7100	1/2 Ton Pickup	1987	$14,700	0	0	0	0	13,200	9,900	6,600	3,300	0	0					2,221	13,560	13,667	8,824	11,400	14,021	4.333	82,000
111	5294	One Ton Truck	1985	$22,400	0	0	13,200	9,900	6,600	3,300	0	0	0	0			3,179	7,852	7,759	15,029	14,663	12,300	11,010	15,672	4.296	102,400
211	8487	One Ton Truck	1988	$22,400	0	0	0	0	0	14,800	11,100	7,400	3,700	0						8,769	9,814	20,348	20,920	26,418	4.215	122,800
210	6227	1/2 Ton Pickup	1986	$14,700	0	0	0	10,000	7,500	5,000	2,500	0	0	0					4,853	14,230	12,640	9,274	9,190	11,153	4.173	137,500
110	6244	1/2 Ton Pickup	1986	$14,700	0	0	0	10,000	7,500	5,000	2,500	0	0	0				3,271	12,737	9,443	11,146	12,250	3,530	8,865	4.166	152,200
111	8520	One Ton Truck	1988	$22,400	0	0	0	0	0	14,800	11,100	7,400	3,700	0						19,831	20,930	19,056	11,610	11,024	4.032	172,600
210	6201	1/2 Ton Pickup	1986	$14,700	0	0	0	10,000	7,500	5,000	2,500	0	0	0					4,584	11,043	11,708	8,015	11,160	12,339	4.003	187,300
110	5261	1/2 Ton Pickup	1985	$14,700	0	0	9,500	7,125	4,750	2,375	0	0	0	0			2,044	5,122	9,186	8,654	8,156	3,780	11,006	10,160	3.953	202,000
237	5129	Compact Cars	1985	$14,000	0	0	9,100	7,280	5,460	3,640	1,820	0	0	0					3,598	5,198	7,582	9,740	11,477	13,609	3.657	216,000
428	6290	Water Tanker	1986	$52,900	0	0	0	43,000	35,833	28,667	21,500	14,333	7,167	(0)					11,235	13,208	29,934	34,045	25,087	35,912	41,217	3.634	268,900
111	6367	One Ton Truck	1986	$22,400	0	0	0	12,500	9,375	6,250	3,125	0	0	0						6,320	7,457	7,874	13,120	15,817	17,515	3.338	289,300
210	7183	1/2 Ton Pickup	1987	$14,700	0	0	0	0	13,200	9,900	6,600	3,300	0	0						1,971	7,727	8,894	8,780	9,484	12,197	3.337	304,000
237	5145	Compact Cars	1985	$14,000	0	0	9,100	7,280	5,460	3,640	1,820	0	0	0						1,391	9,065	9,212	7,180	8,553	10,810	3.302	318,000
210	7118	1/2 Ton Pickup	1987	$14,700	0	0	0	0	13,200	9,900	6,600	3,300	0	0						2,484	6,434	6,158	6,895	12,972	13,420	3.290	332,700
218	5114	Compressor - Mounted	1985	$25,000	0	0	16,000	12,714	11,429	9,143	6,857	4,571	2,286	(0)			3,432	6,377	9,488	13,023	10,195	11,635	12,769	15,163	3.283	357,700
416	5155	5 Ton Dump Truck	1985	$95,000	0	0	62,500	50,000	37,500	25,000	12,500	0	0	0					30,955	36,296	52,550	53,426	47,120	33,320	46,826	3.182	452,700
211	8495	One Ton Truck	1988	$22,400	0	0	0	0	0	14,800	11,100	7,400	3,700	0						8,576	7,448	9,670	18,823	19,370	3.132	472,100
425	2524	16 Yd collectomatic	1982	$97,800	49,000	42,000	35,000	28,000	21,000	14,000	7,000	0	0	0	9,593	21,401	24,581	23,639	29,182	57,803	56,829	20,045	19,845	40,425	3.100	570,900
211	8503	One Ton Truck	1988	$22,400	0	0	0	0	0	14,800	11,100	7,400	3,700	0						7,486	7,696	11,365	16,143	16,663	2.979	591,300
210	6235	1/2 Ton Pickup	1986	$14,700	0	0	0	10,000	8,800	6,600	3,300	0	0	0						3,950	8,656	8,147	8,522	5,944	7,959	2.917	606,000
110	6335	1/2 Ton Pickup	1986	$14,700	0	0	0	10,000	7,500	5,000	2,500	0	0	0						8,662	10,218	11,823	8,043	8,879	4,203	2.913	620,700
210	7142	1/2 Ton Pickup	1987	$14,700	0	0	0	0	13,200	9,900	6,600	3,300	0	0						1,799	6,940	7,005	5,960	10,284	11,035	2.913	635,400
425	2532	16 Yd collectomatic	1982	$97,800	49,000	42,000	35,000	28,000	21,000	14,000	7,000	0	0	0	13,720	28,017	46,736	33,228	34,166	22,005	24,960	23,915	31,826	30,206	2.897	730,200
210	7159	1/2 Ton Pickup	1987	$14,700	0	0	0	0	13,200	9,900	6,600	3,300	0	0						2,297	7,120	7,735	6,928	8,113	9,671	2.861	747,900
210	8097	1/2 Ton Pickup	1988	$14,700	0	0	0	0	0	14,200	10,650	7,100	3,550	0							8,065	9,025	4,250	11,259	9,367	2.856	762,600
210	8405	1/2 Ton Pickup	1988	$14,700	0	0	0	0	0	14,200	10,650	7,100	3,550	0							4,978	4,733	7,977	11,130	12,638	2.821	777,300
212	6167	VAN	1986	$17,500	0	0	0	13,700	10,275	6,850	3,425	0	0	0						3,888	7,960	6,713	9,691	9,599	11,327	2.813	794,800
211	6259	One Ton Truck	1986	$22,400	0	0	0	12,500	9,375	6,250	3,125	0	0	0						2,758	8,780	10,444	5,085	14,023	14,272	2.811	815,230
114	5085	Small Pick-up	1985	$14,900	0	0	10,000	7,500	5,000	2,500	0	0	0	0			1,021	1,584	3,157	8,934	9,170	5,520	3,942	7,997	2.775	830,100
210	7167	1/2 Ton Pickup	1987	$14,700	0	0	0	0	13,200	9,900	6,600	3,300	0	0						1,968	6,159	9,037	8,670	5,427	8,175	2.764	844,500
211	7190	One Ton Truck	1987	$22,400	0	0	0	0	13,300	9,975	6,650	3,325	0	0							11,656	11,725	10,422	10,998	10,372	2.704	865,200
210	7125	1/2 Ton Pickup	1987	$14,700	0	0	0	0	13,200	9,900	6,600	3,300	0	0						6,502	2,480	2,656	5,350	12,170	10,069	2.693	879,900
74	8194	Sidewalk Plows	1988	$62,400	0	0	0	0	0	52,000	43,333	34,667	26,000	17,333							18,964	19,950	47,452	42,354	50,597	2.692	942,300
212	6175	VAN	1986	$17,500	0	0	0	13,700	10,275	6,850	3,425	0	0	0						1,236	8,027	8,515	10,910	6,567	11,219	2.655	959,800
111	6359	One Ton Truck	1986	$22,400	0	0	0	12,500	9,375	6,250	3,125	0	0	0						8,898	8,775	8,456	7,960	10,080	9,306	2.622	982,200
110	3399	1/2 Ton Pickup	1983	$14,700	9,000	6,750	4,500	2,250	0	0	0	0	0	0		1,510	1,825	3,255	4,194	3,288	3,514	5,804	7,796	7,316	2.619	994,900
416	8195	5 Ton Dump Truck	1988	$95,000	0	0	0	86,500	69,200	51,900	34,600	17,300	0	0						8,400	20,449	45,900	46,661	20,600	52,100	54,416	2.618	1,069,900
111	6342	One Ton Truck	1986	$22,400	0	0	0	12,500	9,375	6,250	3,125	0	0	0						3,248	8,468	9,296	14,890	5,553	11,601	2.601	1,110,300
210	7050	1/2 Ton Pickup	1987	$14,700	0	0	0	0	13,200	9,900	6,600	3,300	0	0						2,306	7,942	8,325	6,501	5,464	7,573	2.593	1,125,000
125	3483	16 Yd collectomatic	1983	$97,800	60,000	52,500	45,000	37,500	30,000	22,500	15,000	7,500	0	0		6,077	18,910	26,618	29,320	30,825	32,045	22,520	44,769	43,096	2.578	1,222,800
302	161	Loader	1980	$160,000	59,250	52,667	46,083	39,500	32,917	26,333	19,750	13,167	6,583	0	21,079	40,021	46,905	59,531	56,746	40,035	39,092	18,072	45,165	40,353	2.544	1,382,800
210	6219	1/2 Ton Pickup	1990	$14,700	0	0	0	10,000	7,500	5,000	2,500	0	0	0						3,337	7,069	7,812	5,825	5,921	7,127	2.511	1,397,500
218	5122	Compressor - Mounted	1985	$25,000	0	0	16,000	12,714	11,429	9,143	6,857	4,571	2,286	(0)			2,149	3,830	5,796	8,913	8,925	7,336	12,553	12,579	2.499	1,422,500
74	6222	Sidewalk Plows	1986	$62,400	0	0	0	48,000	40,000	32,000	24,000	16,000	8,000	0						5,747	24,819	25,002	22,430	28,233	20,469	2.245	1,484,900
416	6161	5 Ton Dump Truck	1986	$95,000	0	0	0	86,500	69,200	51,900	34,600	17,300	0	0						12,059	20,574	40,820	36,558	25,700	46,09	48,961	2.450	1,579,900

UNIT #		EQUIPMENT CLASS	MODEL	COST NEW	ANNUAL SALVAGE VALUE 1983	1984	1985	1986	1987	1988	1989	1990	FORE-CAST 1991	1992	ANNUAL EQUIPMENT O&M COSTS 1983	1984	1985	1986	1987	1988	1989	1990	1991	FORE-CAST 1992	PRIORITY FACTOR	CUMMU-LATIVE NEW COST
416	6082	5 Ton Dump Truck	1986	$95,000	0	0	0	86,500	69,200	51,900	34,600	17,300	0	0					17,245	33,300	25,624	36,330	58,556	59,962	2.437	1,574,900
417	7210	Tandem Dump Truck	1987	$132,000	0	0	0	0	116,500	93,200	69,900	46,600	23,300	0					27,310	61,845	55,116	44,250	62,463	66,090	2.396	1,806,900
416	6211	5 Ton Dump Truck	1986	$95,000	0	0	0	86,500	69,200	51,900	34,600	17,300	0	0					10,170	23,657	27,348	28,425	47,980	38,459	52,902	2.389	1,901,900
416	5171	5 Ton Dump Truck	1985	$95,000	0	0	82,500	50,000	37,500	25,000	12,500	0	0	0					23,158	37,739	28,700	31,583	32,536	35,776	36,576	2.379	1,996,900
210	7175	1/2 Ton Pickup	1987	$14,700	0	0	0	0	13,200	9,900	6,600	3,300	0	0					3,767	5,100	5,349	7,800	5,495	7,343	2.371	2,011,600
210	8269	1/2 Ton Pickup	1988	$14,700	0	0	0	0	0	14,200	10,650	7,100	3,550	0						4,884	5,174	11,250	5,153	8,443	2.359	2,026,300
416	6179	5 Ton Dump Truck	1986	$95,000	0	0	0	86,500	69,200	51,900	34,600	17,300	0	0					8,946	23,859	27,043	30,731	31,250	50,173	51,867	2.357	2,121,300
416	5153	5 Ton Dump Truck	1985	$95,000	0	0	82,500	50,000	37,500	25,000	12,500	0	0	0					17,938	27,665	26,200	30,868	25,300	47,514	43,926	2.331	2,216,300
604	109	Sidewalk Plows	1981	$62,400	23,333	17,500	11,667	5,833	0	0	0	0	0	0	6,012	5,867	16,588	14,169	14,479	15,140	15,960	22,120	12,420	19,569	2.257	2,278,700
210	8421	1/2 Ton Pickup	1988	$14,700	0	0	0	0	0	14,200	10,650	7,100	3,550	0						7,290	7,167	11,100	2,900	4,805	2.264	2,293,400
417	7200	Tandem Dump Truck	1987	$132,000	0	0	0	0	116,500	93,200	69,900	46,600	23,300	0					21,923	46,450	55,769	45,800	55,823	65,300	2.205	2,425,400
416	6070	5 Ton Dump Truck	1986	$95,000	0	0	0	86,500	69,200	51,900	34,600	17,300	0	0					22,900	28,250	25,456	49,320	33,223	44,346	2.142	2,520,400
302	5608	Loader	1975	$160,000	16,333	13,750	9,167	4,583	0	0	0	0	0	0	33,165	12,507	27,402	34,501	40,836	37,724	38,862	12,819	60,123	44,275	2.138	2,680,400
312	8543	VAN	1988	$17,500	0	0	0	0	0	14,000	10,500	7,000	3,500	0						2,640	2,267	6,383	11,851	13,823	2.119	2,697,900
145	8651	Street Broom	1978	$154,000	32,625	21,750	10,875	0	0	0	0	0	0	0	12,349	27,740	23,889	34,852	33,000	43,264	41,133	27,240	36,700	42,685	2.096	2,851,900
416	6187	5 Ton Dump Truck	1986	$95,000	0	0	0	86,500	69,200	51,900	34,600	17,300	0	0					7,884	15,195	35,328	35,279	23,540	36,762	42,616	2.070	2,946,900
425	5105	16 Yd collectomatic	1985	$97,800	0	0	63,000	55,125	47,250	39,375	31,500	23,625	15,750	7,875				12,019	18,081	24,941	25,632	27,500	36,940	24,709	35,409	2.017	3,044,700
137	5310	Compact Cars	1985	$14,000	0	0	9,100	7,280	5,460	3,640	1,820	0	0	0					1,098	2,049	6,894	3,830	5,420	3,262	5,532	1.992	3,058,700
211	7026	One Ton Truck	1987	$20,400	0	0	0	0	13,300	9,975	6,650	3,325	0	0					3,582	4,671	4,198	4,415	12,426	10,968	1.988	3,079,100
74	6156	Sidewalk Plows	1986	$62,400	0	0	0	48,000	40,000	32,000	24,000	16,000	8,000	0					17,343	19,393	25,150	26,235	14,402	20,791	1.976	3,141,500
202	2127	Loader	1981	$160,000	70,833	63,750	56,667	49,583	42,500	35,417	28,333	21,250	14,167	7,083	8,705	19,220	35,365	50,069	54,156	29,800	37,[illegible]34	36,200	16,250	36,753	1.962	3,301,500
604	125	Sidewalk Plows	1981	$62,400	23,333	17,500	11,667	5,833	0	0	0	0	0	0	2,128	4,737	13,673	5,343	20,046	14,710	14,699	12,658	15,520	18,897	1.952	3,353,900
202	9163	Loader	1979	$160,000	48,667	42,583	36,500	30,417	24,333	18,250	12,167	6,083	0	0	19,947	23,690	24,516	28,049	31,652	32,200	29,900	16,240	39,700	38,459	1.915	3,523,900
277	5922	Blower Attachment	1965	$114,000	0	0	0	0	0	0	0	0	0	0	6,992	2,636	8,728	16,054	24,114	48,643	45,550	17,700	12,240	34,863	1.900	3,637,900
604	117	Sidewalk Plows	1981	$62,400	23,333	17,500	11,667	5,833	0	0	0	0	0	0	2,748	5,159	10,154	9,175	16,392	15,735	15,760	13,065	9,463	16,556	1.831	3,700,300
110	9248	1/2 Ton Pickup	1989	$14,700	0	0	0	0	0	0	13,800	10,350	6,900	3,450							3,225	6,212	8,962	11,830	1.820	3,715,000
210	8439	1/2 Ton Pickup	1988	$14,700	0	0	0	0	0	14,200	10,650	7,100	3,550	0						2,879	2,840	4,537	7,820	8,449	1.791	3,729,700
111	8538	One Ton Truck	1988	$20,400	0	0	0	0	0	14,800	11,100	7,400	3,700	0						7,340	7,983	7,270	6,817	6,782	1.774	3,750,100
416	6203	5 Ton Dump Truck	1986	$95,000	0	0	0	86,500	69,200	51,900	34,600	17,300	0	0					7,298	14,829	21,650	22,353	23,001	37,524	38,743	1.741	3,845,100
424	5098	25 Yd Collectomatic	1985	$146,200	0	0	85,500	74,813	64,125	53,438	42,750	32,063	21,375	10,688				8,833	22,514	21,927	41,940	36,384	41,250	38,620	51,402	1.739	3,991,300
302	5020	Loader	1985	$160,000	0	0	85,000	77,917	70,833	63,750	56,667	49,583	[illegible]5	35,417				9,106	19,005	25,780	53,332	64,384	39,200	33,439	57,874	1.728	4,151,300
212	6233	VAN	1986	$17,500	0	0	0	13,700	10,275	6,850	3,425	0	0	0					1,156	4,170	4,270	3,268	6,700	4,522	5,876	1.721	4,168,800
210	7069	1/2 Ton Pickup	1987	$14,700	0	0	0	0	13,200	9,900	6,600	3,300	0	0						2,061	2,040	1,670	3,554	8,913	7,563	1.710	4,183,500
416	7078	5 Ton Dump Truck	1987	$95,000	0	0	0	0	86,000	76,400	52,800	35,200	17,600	0						10,891	28,129	27,478	16,500	37,601	38,158	1.703	4,278,500
111	8512	One Ton Truck	1988	$20,400	0	0	0	0	0	14,800	11,100	7,400	3,700	0							3,805	3,750	8,760	7,210	10,288	1.697	4,298,900
302	3512	Loader	1973	$160,000	8,500	4,250	0	0	0	0	0	0	0	0	31,362	29,096	35,672	32,331	46,115	22,750	22,384	22,370	22,447	5,615	1.689	4,458,900
416	3077	5 Ton Dump Truck	1983	$95,000	41,000	32,800	24,600	16,400	8,200	0	0	0	0	0	2,099	4,384	4,870	7,527	25,091	24,931	25,967	16,900	29,579	25,997	1.688	4,553,900
114	8378	Small Pick-up	1988	$14,900	0	0	0	0	0	14,000	10,500	7,000	3,500	0						1,392	1,272	2,160	8,858	10,282	1.678	4,568,800
210	7134	1/2 Ton Pickup	1987	$14,700	0	0	0	0	13,200	9,900	6,600	3,300	0	0						1,420	6,353	6,523	2,465	3,155	3,858	1.617	4,583,500
124	3492	25 Yd Collectomatic	1983	$146,200	82,000	71,750	61,500	51,250	41,000	30,750	20,500	10,250	0	0		9,219	21,375	25,688	25,224	32,810	30,749	22,830	32,005	35,145	1.607	4,729,700
237	5111	Compact Cars	1985	$14,000	0	0	9,100	7,280	5,460	3,640	1,820	0	0	0						1,484	900	2,840	9,820	1,403	5,862	1.583	4,743,700
424	5569	25 Yd Collectomatic	1985	$146,200	0	0	85,500	74,813	64,125	53,438	42,750	32,063	21,375	10,688							48,241	45,450	45,785	51,178	50,950	1.566	4,889,900
110	9230	1/2 Ton Pickup	1989	$14,700	0	0	0	0	0	0	13,800	10,350	6,900	3,450								2,917	8,745	5,851	8,772	1.553	4,904,600
277	5914	Blower Attachment	1965	$114,000	0	0	0	0	0	0	0	0	0	0	7,495	575	5,396	3,843	18,058	30,800	38,430	25,260	14,329	32,000	1.528	5,018,600
114	8154	Small Pick-up	1988	$14,900	0	0	0	0	0	14,000	10,500	7,000	3,500	0							2,700	2,800	4,795	5,599	6,617	1.507	5,033,500
237	7042	Compact Cars	1987	$14,000	0	0	0	0	10,500	8,400	6,300	4,200	2,100	0							1,071	1,829	2,116	3,220	6,144	6,337	1.480	5,047,500
277	5930	Blower Attachment	1965	$114,000	0	0	0	0	0	0	0	0	0	0	1,829	939	8,896	10,536	24,493	26,215	25,500	18,115	16,859	28,185	1.417	5,161,500
302	5012	Loader	1985	$160,000	0	0	85,[illegible]0	77,917	70,833	63,750	56,667	49,583	42,500	35,417				9,969	21,013	23,394	37,002	36,154	35,410	47,200	51,913	1.416	5,321,500
74	7229	Sidewalk Plows	1987	$62,400	0	0	0	0	50,000	41,667	33,333	25,[illegible]00	16,667	8,333						10,716	22,144	22,013	10,715	15,200	15,419	1.406	5,383,900
211	7016	One Ton Truck	1987	$20,400	0	0	0	0	13,300	9,975	6,650	3,325	0	0						3,259	2,182	2,483	8,802	4,704	7,139	1.400	5,404,300
377	9188	Blower Attachment	1979	$114,000	44,000	40,000	36,000	32,000	28,000	24,000	20,000	16,000	12,000	8,000	5,598	3,233	8,446	13,036	24,070	34,209	34,220	4,123	15,200	25,286	1.399	5,518,300
113	8783	VAN	1988	$17,500	0	0	0	0	0	14,000	10,500	7,000	3,500	0							2,458	2,986	4,210	6,842	7,703	1.385	5,535,800

UNIT #		EQUIPMENT CLASS	MODEL	COST NEW	ANNUAL SALVAGE VALUE 1983	1984	1985	1986	1987	1988	1989	1990	1991	FORE-CAST 1992	ANNUAL EQUIPMENT O&M COSTS 1983	1984	1985	1986	1987	1988	1989	1990	1991	FORE-CAST 1992	PRIORITY FACTOR	CUMMU-LATINE NEW COST
546	6305	Street Broom	1986	$154,000	0	0	0	125,000	109,375	93,750	78,125	62,500	46,875	31,250				14,139	26,959	33,742	36,577	41,565	41,025	50,441	1.379	5,669,800
424	5276	25 Yd Collectomatic	1986	$146,200	0	0	0	93,000	81,375	69,750	58,125	46,500	34,875	23,250					21,622	44,795	38,804	44,165	31,198	41,643	1.361	5,636,000
424	7102	25 Yd Collectomatic	1987	$146,200	0	0	0	0	111,500	97,563	83,625	69,688	55,750	41,813						30,890	36,184	44,720	60,314	67,229	1.351	5,992,200
210	8413	1/2 Ton Pickup	1988	$14,700	0	0	0	0	0	14200	10650	7100	3,550	0						2584	2500	3000	5,780	5,966	1.350	5,996,900
237	5137	Compact Cars	1985	$14,000	0	0	9,100	7,280	5,460	3,640	1,820	0	0	0					2,189	4,174	3,799	1,345	3,965	3,311	1.342	6,010,900
417	8448	Tandem Dump Truck	1988	$132,000	0	0	0	0	0	120,000	96,000	72,000	48,000	24,000							33,800	42,059	40,550	39,885	43,264	1.330	6,142,900
416	2442	5 Ton Dump Truck	1982	$95,000	32800	24,600	16,400	8,200	0	0	0	0	0	0	5373	6,642	11,256	22,948	9,707	14,760	10,768	16,946	9,075	14,960	1.291	6,237,900
431	3474	Pothole Patcher	1983	$92,400	71,350	61,157	50,964	40,771	30,579	20,386	10,193	(0)	0	0		4,711	9,939	10,671	20,244	9,791	9,355	13,457	21,630	18,994	1.286	6,300,300
424	7144	25 Yd Collectomatic	1987	$146,200	0	0	0	0	111,500	97,563	83,625	69,688	55,750	41,813						35,500	37,805	33,105	51,508	60,311	1.275	6,476,500
420	2065	Hoist Truck	1982	$88,400	34,125	29,250	24,375	19,500	14,625	9,750	4,875	0	0	0	2,282	2,927	6,832	9,668	11,255	10,900	13,023	17,840	15,187	19,159	1.234	6,564,900
416	6245	5 Ton Dump Truck	1986	$95,000	0	0	0	66,500	59,200	51,900	34,600	17,300	0	0					7,961	15,965	16,250	16,710	29,42*	30,361	1.228	6,659,900
110	9214	1/2 Ton Pickup	1989	$14,700	0	0	0	0	0	0	13,600	10,350	6,900	3,450							1,854	7,777	4,452	7,132	1.200	6,674,600
74	8202	Sidewalk Plows	1988	$62,400	0	0	0	0	0	52,000	43,333	34,667	26,000	17,333							16,990	18,032	23,280	16,200	19,345	1.194	6,737,000
210	7092	1/2 Ton Pickup	1987	$14,700	0	0	0	0	13,200	9,900	6,600	3,300	0	0						1,749	3,560	3,591	5,310	569	2,773	1.194	6,751,700
424	6047	25 Yd Collectomatic	1986	$146,200	0	0	0	93,000	81,375	69,750	58,125	46,500	34,875	23,250						11,473	28,750	34,289	32,240	41,520	49,730	1.186	6,867,900
424	7110	25 Yd Collectomatic	1987	$146,200	0	0	0	0	111,500	97,563	83,625	69,688	55,750	41,813							36,409	37,900	44,305	45,09*	49,039	1.169	7,044,100
166	2048	Gang Mower	1982	$33,000	15,750	13,500	11,250	9,000	6,750	4,500	2,250	0	0	0	1,389	8,048	8,810	7,503	2,795	2,017	883	621	4,760	1,580	1.164	7,077,100
202	2101	Loader/Snwblwr - fixed	1982	$239,000	0	0	0	0	0	0	0	0	0	0	28,420	4,635	7,420	17,552	43,272	35,421	38,900	32,415	25,405	38,813	1.138	7,316,100
424	7094	25 Yd Collectomatic	1987	$146,200	0	0	0	0	111,500	97,563	83,625	69,688	55,750	41,813							36,420	38,275	36,230	48,530	48,423	1.136	7,482,300
146	8585	Street Broom	1988	$154,000	0	0	0	0	0	161,000	119,875	102,750	85,625	68,500							27,726	32,800	45,325	64,016	72,818	1.130	7,616,300
456	9099	Gang Mower	1979	$33,000	8,500	6,375	4,250	2,125	0	0	0	0	0	0	4,265	668	343	4,394	3,058	5,539	5,339	2,887	5,156	5,221	1.112	7,649,300
416	9033	5 Ton Dump Truck	1989	$95,000	0	0	0	0	0	0	91,000	72,800	54,600	36,400								11,600	24,100	45,034	60,345	1.102	7,744,300
424	7128	25 Yd Collectomatic	1987	$146,200	0	0	0	0	111,500	97,563	83,625	69,688	55,750	41,813								34,764	37,850	39,455	43,510	45,856	1.092	7,890,500
424	6054	25 Yd Collectomatic	1986	$146,200	0	0	0	93,000	81,375	69,750	58,125	46,500	34,875	23,250							13,931	26,960	26,704	38,115	33,800	43,170	1.090	8,036,700
416	9074	5 Ton Dump Truck	1988	$95,000	0	0	0	0	0	91,000	72,800	54,600	36,400	18,200								4,703	6,495	25,680	36,912	47,391	1.084	8,151,700
6	1101	Portable Compressor	1981	$20,600	5,714	4,571	3,429	2,286	1,143	0	0	0	0	0	825	1,984	2,968	2,964	1,679	2,305	2,470	2,400	2,100	2,576	1.082	8,152,300
202	2119	Loader/Snwblwr - fixed	1982	$239,000	0	0	0	0	0	0	0	0	0	0	18,233	7,827	13,554	15,977	44,727	28,010	31,700	30,059	29,556	37,764	1.077	8,391,300
120	5228	Hoist Truck	1985	$88,400	0	0	61,500	53812.5	46,125	38,438	30,750	23,063	15,375	7,688				8413	10,929	15,821	17,493	13,670	8,741	27,198	1.070	8,479,700
416	6252	5 Ton Dump Truck	1986	$95,000	0	0	0	66,500	59,200	51,900	34,600	17,300	0	0					7,891	13,790	15,445	19,320	19,410	23,828	1.047	8,574,700
456	7275	Gang Mower	1977	$33,000	6,500	3,250	0	0	0	0	0	0	0	0	1,539	1,382	3,496	1,867	2,035	2,405	2,654	2,417	10,063	5,984	1.044	8,607,700
307	2543	Small Dozer	1982	$65,000	24,300	21,600	18,900	16,200	13,500	10,800	8,100	5,400	2,700	0	2,946	24,729	7,573	17,322	888	4,655	1,032	1,250	6,603	648	1.041	8,672,700
377	145	Blower Attachment	1980	$114,000	48,000	44,000	40,000	36,000	32,000	28,000	24,000	20,000	16,000	12,000	3,766	3,050	4,617	4,122	21,498	26,023	26,650	7,348	9,730	28,431	1.011	8,786,700
210	291	1/2 Ton Pickup	1990	$14,700	0	0	0	0	0	0	0	14,000	10,500	7,000									5,415	7,245	9,075	1.002	8,801,400
212	8577	VAN	1988	$17,500	0	0	0	0	0	14,000	10,500	7,000	3,500	0							319	5,441	764	5,311	5,534	0.992	8,818,900
210	246	1/2 Ton Pickup	1990	$14,700	0	0	0	0	0	0	0	14,000	10,500	7,000									5,510	7,093	8,676	0.971	8,833,600
110	9222	1/2 Ton Pickup	1989	$14,700	0	0	0	0	0	0	13,600	10,350	6,900	3,450								2,491	5,130	3,882	5,227	0.903	8,849,300
377	5863	Blower Attachment	1975	$114,000	23,333	20,000	16,667	13,333	10,000	6,667	3,333	(0)	0	0	1,112	3,756	4,373	4,655	17,285	17,490	15,632	3,640	14,200	16,407	0.864	8,982,300
354	7080	Small Backhoe	1987	$65,000	0	0	0	0	56,000	46,667	37,333	28,000	18,667	9,333						8,340	8,345	15,940	14,200	16,000	0.854	9,027,300
120	5236	Hoist Truck	1985	$88,400	0	0	61,500	53,813	46,125	38,438	30,750	23,063	15,375	7,688				8,062	11,299	14,360	14,450	7,550	12,140	12,235	0.819	9,115,700
177	6897	Blower Attachment	1976	$114,000	26,667	23,333	20,000	16,667	13,333	10,000	6,667	3,333	(0)	0	1,269	304	569	28,112	32,653	7,865	7,815	3,230	1,857	9,656	0.817	9,229,700
211	9300	One Ton Truck	1989	$20,400	0	0	0	0	0	0	16,000	12,000	8,000	4,000								966	3,544	6,244	8,663	0.765	9,250,100
211	9212	One Ton Truck	1989	$20,400	0	0	0	0	0	0	16,000	12,000	8,000	4,000									1,974	6,530	11,086	0.764	9,270,500
354	8690	Small Backhoe	1988	$65,000	0	0	0	0	0	57,000	47,500	38,000	28,500	19,000							6,030	6,118	11,547	20,936	23,695	0.759	9,335,500
377	5889	Blower Attachment	1975	$114,000	23,333	20,000	16,667	13,333	10,000	6,667	3,333	(0)	0	0	8,991	473	5,225	4,246	8,824	19,042	14,550	4,460	8,550	11,899	0.757	9,449,500
416	9066	5 Ton Dump Truck	1989	$95,000	0	0	0	0	0	0	91,000	72,800	54,600	36,400								4,420	21,340	30,965	45,480	0.693	9,544,500
110	9271	1/2 Ton Pickup	1989	$14,700	0	0	0	0	0	0	13,600	10,350	6,900	3,450								1,544	3,006	3,794	5,032	0.675	9,569,200
366	6146	Gang Mower	1986	$33,000	0	0	0	7,000	6,125	5,250	4,375	3,500	2,625	1,750				494	1,917	4,477	3,234	2,919	4,046	4,800	0.610	9,592,200
566	30	Gang Mower	1980	$33,000	10,938	8,750	6,563	4,375	2,188	0	0	0	0	0	2,979	1,320	1,255	4,435	1,551	1,741	1,705	564	1,950	1,270	0.569	9,625,200
207	8651	Compact Cars	1988	$14,000	0	0	0	0	0	12,000	9,600	7,200	4,800	2,400							783	2,462	3,470	1,051	2,401	0.555	9,639,200
366	4026	Gang Mower	1984	$33,000	0	6,600	5,500	4,800	4,000	3,200	2,400	1,600	800	0		27	655	1,717	2,587	1,372	2,194	3,670	2,350	3,512	0.548	9,672,200
214	9839	Small Pick-up	1989	$14,900	0	0	0	0	0	0	14,000	10,500	7,000	3,500								1,858	1,910	3,500	4,057	0.526	9,687,100
366	4034	Gang Mower	1984	$33,000	0	6,600	5,500	4,800	4,000	3,200	2,400	1,600	800	0		54	1,245	937	1,385	2,262	2,317	1,702	3,842	3,530	0.523	9,720,100

UNIT #		EQUIPMENT CLASS	MODEL	COST NEW	ANNUAL SALVAGE VALUE 1983	1984	1985	1986	1987	1988	1989	1990	1991	FORE-CAST 1992	ANNUAL EQUIPMENT O&M COSTS 1983	1984	1985	1986	1987	1988	1989	1990	1991	FORE-CAST 1992	PRIORITY FACTOR	CUMMU-LATIVE NEW COST
416	9058	5 Ton Dump Truck	1989	$95,000	0	0	0	0	0	0	91,000	72,800	54,600	36,400							4,365	20,045	24,613	36,569	0.518	9,815,100
466	5709	Gang Mower	1965	$33,000	0	0	0	0	0	0	0	0	0	0		762	2,237	2,640	1,544	1,905	1,960	1,060	2,509	2,063	0.506	9,848,100
366	6138	Gang Mower	1986	$33,000	0	0	0	7,000	6,125	5,250	4,375	3,500	2,625	1,750				733	3,742	2,492	2,821	2,572	2,765	3,239	0.504	9,881,100
237	8766	Compact Cars	1988	$14,000	0	0	0	0	0	12,000	9,600	7,200	4,800	2,400						879	883	2,067	2,321	1,915	0.476	9,895,100
237	8743	Compact Cars	1988	$14,000	0	0	0	0	0	12,000	9,600	7,200	4,800	2,400						366	2,248	2,505	1,403	2,470	0.471	9,909,100
766	3073	Gang Mower	1983	$33,000	18,600	16,275	13,950	11,625	9,300	6,975	4,650	2,325	0	0		3,332	2,710	1,954	1,167	822	1,080	1,231	1,864	676	0.451	9,942,100
766	3048	Gang Mower	1983	$33,000	18,600	16,275	13,950	11,625	9,300	6,975	4,650	2,325	0	0		28	50	90	306	1,864	2,057	2,020	4,375	3,906	0.445	9,975,100
110	9206	1/2 Ton Pickup	1989	$14,700	0	0	0	0	0	0	13,800	10,350	6,900	3,450							1,020	2,271	2,887	3,826	0.440	9,989,800
110	9263	1/2 Ton Pickup	1989	$14,700	0	0	0	0	0	0	13,800	10,350	6,900	3,450							662	2,100	2,908	4,136	0.432	10,004,500
257	4044	Large Roller	1974	$105,000	3,300	0	0	0	0	0	0	0	0	0	4,756	4,617	1,120	5,671	5,429	3,570	3,460	9,050	1,850	4,663	0.419	10,109,500
466	9107	Gang Mower	1979	$33,000	8,500	6,375	4,250	2,125	0	0	0	0	0	0	990	1,609	692	225	1,699	1,495	1,229	2,166	1,850	1,663	0.413	10,142,500
212	46	VAN	1990	$17,500	0	0	0	0	0	0	0	15,500	11,625	7,750								1,040	4,766	8,492	0.374	10,160,000

BIBLIOGRAPHY

Blankenship, J., Designing Your Own Software for Fleet Management, APWA Reporter, August 1987.

Daidone, J.L., When to Replace Vehicles, The Product Information Network, 1985.

Dinneen, J. T., A Fleet-Management Philosophy, APWA Reporter, March 1989.

Dolce, J., Fleet Management, McGraw Hill, 1982.

Enrick, N.L., Decision-Oriented Statistics, Brandon/Systems Press, Inc., 1970.

Ferrara, W.L., The Lease-Purchase Decision: How Some Companies Make It, National Association of Accountants, 1978.

Gardner, E.S., Forecasting Using Exponential Smoothing, Lotus Magazine, March 1987.

Jardine, A.K.S., Maintenance, Replacement and Reliability, Pitman Publishing, 1973.

Klaassen, J. and Verburg, P., Replacement Costs for Managerial Purposes, Elsevier Science Publishers, 1984.

Nazem, S.M., Applied Time Series Analysis for Business and Economic Forecasting, Marcel Dekker, Inc., 1988.

Foff, C.A., Commercial Motor Transportation, 6th Edition, Cornell Maritime Press Inc., 1980.

Wyckoff, D.D., Organizational Formality and Performance in the Motor Carrier Industry, Lexington Books, 1977.